J.G. Herder and the Philosophy and History of Science

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P A R T II:

Herder and the History of Science: his own Theories, and his Knowledge of the Science of his Age.

Introduction.

The evolutionary process involves a development from purely physical forms to new forms possessing life, and ultimately to others equipped with mind. The modern sciences emerged, from the Renaissance to the present, in broadly the same order: the basic principles of the physical sciences were laid down first, then the biological sciences made their greatest advances, and finally, the sciences of man took on their present form. Similarly, any scientific problem which involves more than one of these levels must usually be approached first of all in its fundamental, i.e. physical aspects, and only later can the more involved biological or psychological phenomena be clearly understood.

Herder rightly follows this sequence of investigation in his „Ideen". Unfortunately, however, if we disregard his early grounding in mathematics and physical science during his university and teaching years (as well as his sporadic encounters with information from all the sciences in the course of his multifarious reading), we find that his scientific studies, so far as they are directed by a specialised interest which finds detailed expression in his works, follow exactly the reverse order. First arose his interest in the psychology of art and the phases of human society; then he set out to establish psychology upon a physiological, i.e. biological basis. While preparing his „Ideen", which again treat of human society, he embarked upon a wider study of general biology and natural history, although the physical sciences are also represented in this work, in a subordinate position. Finally, in the „Adrastea", we find his scientific interest confined entirely to the physical disciplines, such as astronomy, light, and colour.

This reversed order of study helped to produce the anthropomorphic and

anthropocentric presentations we have already encountered in his biological thought, as well as animistic and organismic doctrines in his final theories of the physical world.

While we shall try not to lose sight of this unusual feature of Herder's development, we shall examine his knowledge of the sciences in the normal sequence; this should help us to prevent earlier conceptions from influencing our attitude to later ones, as happened with Herder himself, and, secondly, it should make it easier for us to assess his ideas impartially as contributions to the scientific tradition.

CHAPTER I

The Physical Sciences.

Herder obtained some knowledge of the physical sciences from Kant's lectures, which dealt, among other things, with the classification of the physico-mathematical sciences, and with physical geography. He also read Kant's „Allgemeine Naturgeschichte" at an early date. Caroline Herder tells us that he further attended Teske's lectures, devoted entirely to physics, at Königsberg.[1] His library included physical treatises by J. Clauberg, J.A. Comenius, the French Académie des Sciences, J. Keill, S. Majolus, H. Regius, J.C. Stock, and Chr. Wolff;[2] in the „Journal", he mentions various writers upon physics, such as Mariotte, Nollet, Toricelli, and Tsirnhausen,[3] although he did not subsequently study them all in detail as he had intended. All this, apart from the numerous writers upon all branches of physical science whose influence upon Herder we shall shortly discuss, amply shows that, from an early date, he showed interest in a wide selection of authorities on the physical sciences, and physics in particular, although this interest reached its height only in his later years. (We have already examined Herder's knowledge of exact mathematical disciplines in our section on mathematics.) A telling remark he made to Hamann may prepare us in advance to understand the shortcomings of his own physical theories:[3a]

> Ich traue mir nicht im Kleinsten ein Mechanisches Genie zu, und vielleicht sind im Physischen und Politischen Verstand meine Augen dazu zu kurzsichtig.

But before we begin a full discussion of Herder's knowledge of the various physical sciences, we must first decide what his opinions were concerning the basic elements of the physical world.

1. The nature of the physical world.

a) The nature of matter, and atomic theories.

The earliest physical theories, such as those of the pre-Socratic philosophers and those of ancient China, usually postulate not one, but several basic kinds of matter - such was the long-lived theory of the "four elements". Yet even in some pre-Socratic thinkers we can detect a monistic tendency to select one element as the most powerful, or even as the progenitor of the others: this happened in Thales' theory of water, Heraclitus' theory of fire, and so on.

With the later Greek philosophers, and, more particularly, with the influx of Judaeo-Christian ideas into European thought, there arose dualistic theories which distinguished physical matter (collectively) from the spiritual category of mind.

Much of later philosophy and psychology is dominated by the problems resulting from this dualism. Monistic thinkers rejected the dualism either by denying that one or other of the two poles had any separate identity, or by seeking some higher common factor supposed to lie behind both. Herder, as we know, tended to favour monism. Thus, in discussing his theory of matter, we cannot disregard his beliefs concerning mind, as we could with any thoroughly dualistic thinker; conversely, we cannot deal with his theory of mind as a purely psychological question without referring to his conception of matter. For, in all monistic philosophies, mind and matter are each defined in relation to the other, which is either negated, or accommodated in some way to its opposite. Herder, as we know, usually adopts the latter solution. We shall therefore proceed to discuss Herder's theories

of matter, referring, where necessary, to his theories of mind, but reserving our separate exposition of his views on mind for our chapter on psychology.

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R.T. Clark Jnr. maintains:[4]

> In Herder's epistemology there is no science of matter. --- At no time does he devote any attention to the conception of matter. He does not, like Bishop Berkeley, deny its existence; he simply ignores it.

This is not strictly true, as we shall see; for although Herder's works yield no science of matter in the physicist's sense, they do present us with several divergent solutions to the philosophical problem of matter.

We noticed in our discussions of Herder's „Kraft" that this idea was used to reconcile mind and matter. Let us examine this rôle of „Kraft" in further detail.

Some critics maintain that Herder's „Kräfte" are purely spiritual. This implies that he denies the existence of any non-spiritual or inanimate matter, independent of the „Kräfte" themselves. Thus Siegel conceives of Herder's „Kräfte" as basically idealistic, as „Geist",[5] and later says that Herder is ultimately a „Spiritualist",[6] despite his occasional utterances of an almost materialistic tenor. Caroline, in her memoirs, indeed says that Herder believed that physics would come to recognise more and more „geistige Kräfte".[7] He says himself, on one occasion, that all „Kräfte" are „von geistiger Art"; but in the latter case, he is referring in particular to the soul and its immortality.[8] However, Richter also describes Herder's monism as a form of „Spiritualismus",[9] and Götz, quoting passages to illustrate how Herder uses „Kräfte" to define mind, concludes that he

affords no place whatsoever to materialism in his ideas.[10] Hoffart is just as uncompromising, saying that, for Herder, „Auch die Materie besteht aus Kräften", which are purely immaterial; this writer thereby denies that matter has any distinct reality for Herder.[11] Herder does, in fact, state (in his „Gott"): „--- auch das Organ selbst ist ein System von Kräften", and he speaks of „diese die Materie ausmachenden Kräfte",[12] thus lending support to Hoffart's contention. Most critics agree that Leibniz's influence encouraged him in these more "spiritualistic" statements.[13]

However, statements of a completely different kind appear elsewhere in Herder's writings. The following passage appears in the compilation „Herders Lebensbild",[14] and is there said to date from the Riga period; it was republished by Suphan, who on one occasion dates it in 1769, on another in 1771.[15] From our earlier conclusions, we can assert that this utterance seems typical of Herder's views in 1769:

> Wenn alle klare Ideen aus dunkeln werden: so auch Gedanken aus Bewegung der Materie.

Haym quotes the passage, noting how close it is to materialism,[16] and Siegel refers to it, alluding to it, however, as thoroughly untypical.[17] We must also add, in justice, that Herder continues with the qualification that his statement would still be true „--- wenn endliche Materien doch nur nichts als Vorstellungen einfacher Wesen sind, die nicht Materie sind"; these „einfache Wesen", as Haym observes,[18] are Leibniz's monads, and Herder introduces them in order to leave the way open to his alternative theory of „Kräfte", which so often replace matter in his philosophy. However, again in 1769, he writes to Mendelssohn of the „Grundstoff der Kräfte", thus apparently implying that „Stoff" is more basic than „Kraft".[19]

We earlier noticed that Herder, in the fourth „Kritisches Wäldchen", also of 1769, speaks of man's „materielle Seele";[20] in examining his various approaches to the problem of perception, we saw that his more sensationalistic theories carried strong materialistic overtones. Again, in the „Ideen" and after, Herder often reduces the various „Kräfte" of the physical world to material agencies (e.g. „Wärmestoff", „Lichtteile", „magnetische Materie", „Aether", etc.); we shall encounter such reductions of „Kräfte" to matter in the appropriate sections, and note meanwhile that, since he frequently employs these „Kräfte" to describe the vital „Kräfte" behind organic life, he cannot avoid implying that life, and therefore also the soul which manifests itself in life, are of a subtle but material nature. Such an inference recalls the "pneuma" of the Stoics, and Swedenborg's belief in a subtle, material soul.[21] Kühnemann rightly speaks of Herder's „spiritualistische und doch auch materialistische Gedanken von der Lebenswärme" in a similar context.[22] Lange, in his monumental history of materialism, rightly notices that significant elements of materialism are present in Herder's philosophy.[23] Critics such as the Marxist Reimann go too far, as we have already seen, in claiming that Herder was a complete (dialectical) materialist.

We earlier noticed that Herder, in his theory of a universal "type", and in various descriptions of the growth of organisms, at times maintains that the complete organic form is nothing more than a configuration of interacting „Kräfte". On the other hand, he often says, as in his „Gott", that these „Kräfte" must operate within a material „Organ".[24] In these latter utterances, he clearly accepts that both „Kräfte" and inanimate matter exist; this at once recalls the traditional dualism of matter and mind or spirit.

Thus he likewise declares in the „Ideen":[25]

> Es ist organische Materie, zu der lebendige Kräfte kommen müssen, sie erst zur Gestalt des künftigen Geschöpfs zu bilden.

On this occasion, Herder is arguing in favour of the soul's immortality. It is on such occasions that the latent dualism within his „Kraft" theory becomes most apparent. In such cases, it is no longer a question of a dualism of „Kräfte" and forms which arise out of their interaction, but of „Kräfte" and traditional inert matter, i.e. two separate entities.

But even in a completely naturalistic context Herder says, in the same work, of his organic „Kraft" „--- daß sie organische Teile sich aus dem Chaos einer homogenen Materie zueigne."[26] Here, he unmistakably concedes that an inert matter, divisible into „Teile", has a separate existence. On the other hand, he again affirms in the „Adrastea", that no matter exists apart from indwelling „Kräfte".[27] This recalls Leibniz's statement:[28]

> --- il y a un Monde de Créatures, de Vivans, d'Animaux, d'Entelechies, d'Âmes dans la moindre partie de la matière.

Thus, McEachran's remark that Herder believes in a "dead" matter imbued with vitalising forces,[29] and a similar contention of Posadzy's,[30] would indeed apply to the more dualistic passages we have cited, but not to the others which define even matter as consisting of „Kräfte".

The dualistic statements involving both matter and „Kraft" recall the "active and passive principles", force and matter, of Stoic philosophy,[31] and, on a more strictly physical level, the force and matter of classical physics; on the biological and psychological levels, they remind us of the dualistic vitalism associated with more religiously inclined biologists up to

the first quarter of the present century. As for individuals whose ideas were known to Herder, Schmidt points out that Shaftesbury believed in both matter and force,[32] and we know from Herder's notes that Einsiedel did so too.[33]

In the light of such conflicting ideas as all these, it is no wonder that Herder declared in 1774 of the soul and its „Kräfte":[34]

> Wir werden sie nie ganz übersehen, wenn wir uns immer nur bei einer Seite aufhalten, bei dem Idealismus ihrer Kräfte, oder bei den qualitatibus secundis körperlicher Ideen --- Auf der Höhe des Meers ist freie grosse Fahrt.

He repeats this point in the more famous words which occur in the 1778 version of „Vom Erkennen und Empfinden":[35]

> Weiß ich noch nicht, was Material oder Immaterial sei?

Thus, it should be clear that it is not enough to say that Herder was a materialist or a spiritualist, or a dynamist, a believer that only „Kraft", the common denominator of matter and mind, exists. He is all of these, often with hints of traditional dualism, and it would probably be true to say that he used his „Kraft" conception not only to paper over a concealed dualism, but also as an ambiguous device by which he could employ purely materialistic ideas on some occasions, and purely spiritualistic ones on others. Though sometimes uneasily aware of the resultant difficulties, which led him to take refuge in such statements as that „Kräfte" are intrinsically unknowable, or that the border between the material and the non-material cannot be defined, he was probably not fully conscious that his "synthesis" was really a means of believing in two conflicting opinions simultaneously.

What is the scientific significance of all this? Boscovich resolved matter entirely into purely relational, but mathematically delineable forces in a way which anticipated much of modern physical theory. Classical physics (i.e. Newtonian mechanics) operated with quantitative matter (mass) and force, leaving mind as a category quite distinct from physical force, and outside the purview of physics. Materialistic theorists of science declared that physical matter and force, with their physical or mechanical laws, applied to mind as well as to inert matter, but pursued their more strictly physical investigations in the traditional way. All of these theories are unambiguous, and each could provide a working basis for the growth of physical science. Herder's theories of matter, however, are incorrigibly ambiguous, and belong almost wholly to the realm of metaphysics, and, taken together, have no place in any coherent theory of the physical world. His later tendency to emphasise formal natural laws, which govern units whose intrinsic quality or content is either unknown or irrelevant, was a more auspicious beginning. But he always returned to the practice which he recommended in his review of Thorild's „Maximum sive Archimetria" in 1800:[36)]

> --- so möchte Bacons Weg; ‚was ist da? was giebts?' erst strenge zu verfolgen seyn, ehe man an das Gefundene oder Empfundene Maas legen und fragen kann: <u>wie viel</u> giebts? <u>wie viel</u> muß es geben?

He was too preoccupied with the qualitative „Was?" to do justice to the quantitative, and more scientific „Wie viel?"

Similar ambiguity arises when Herder discusses the ultimate structure

of matter. His first reference to atomic theories appears in an early extract from Leibniz's "Nouveaux Essais":[37]

> Wäre die Materie aus völlig harten Theilen zusammengesetzt, so wäre die Bewegung im Vollen unmöglich. Vielmehr ist der Raum voll von einer ursprünglich flüssigen Materie, die aller Theilung fähig und auch aller Theilung ins Unendliche ausgesetzt ist.

The density of this matter varies locally according to degrees of motion; no part is either impenetrable or infinitely fluid.

In an early version of the „Ideen", Pt. IV, Herder says in passing that the world is composed of both „Kräfte" and atoms.[38] In his „Gott", he again affirms that atoms are the ultimate components of the universe,[39] referring, however, to Leibniz's (ideal) monads and to Boscovich's atomic theory. He calls atoms, as defined by Boscovich, „untheilbare wirkende Elemente ---, ohne welche sich die Natur der Körper selbst physisch nicht erklären läßt.[40] These "indivisible elements", however, are clearly at variance with the infinitely divisible matter Herder had described in his early extracts from Leibniz, and which Leibniz had again described in his „Monadologie".[41] In another version of his „Gott", Herder speaks of „manches unphilosophischen Wahnes, daß es z.B. Atomen, absolut=harte Körper und dergleichen in der Natur gebe. --- ein unendlich kleiner Atom hemmte die Räder der ganzen Schöpfung",[42] repeating this objection in the „Adrastea" of his last years.[43] But if there are no infinitely hard (and therefore indivisible) units, matter must be infinitely divisible; yet we have just seen that Herder described Boscovich's atoms as „untheilbar", and considered such units as necessary for any account of the physical world.

It seems, therefore, that Herder had no certain views upon the atomic

theory of matter. Although chemists since the time of Boyle had used the theory without worrying unduly about the intrinsic nature of the atoms, philosophers such as Leibniz rejected them and considered that matter was infinitely divisible, so that no ultimate, extended particles, such as Lucretius, Gassendi, Huygens and Boyle had postulated, could exist. Boscovich revised Leibniz's theory by identifying the ultimate units of matter with mathematical points.[44] These are, in a sense „untheilbar", since a point is not extended. If this is what Herder meant in his approving description of Boscovich's theory, he is freed from the charge of inconsistency, and can thus be classed as a Leibnizian who accepted the physically superior version of the Leibnizian theory of matter put forward by Boscovich. But, since Boscovich's inter-atomic forces were purely relational and mathematical,[45] whereas Herder considered his own „Kräfte" as real and dynamistic, the parallel is far from complete. As in his theory of matter and „Kraft", he seems to have been uncertain about the ultimate nature of atoms, and put forward no constructive or coherent physical theory concerning them.

Lange, referring in his history of materialism to all who attempt to describe the ultimate nature of matter and its constituents, sagely declares[46] „daß das ganze Problem von Kraft und Stoff in ein Problem der Erkenntnis=theorie ausläuft und daß für die Naturwissenschaften ein sicherer Boden nur in den Relationen zu finden ist, wobei immerhin gewisse Träger dieser Relationen, wie z.B. die Atome hypothetisch eingeführt und wie wirkliche Dinge behandelt werden dürfen; vorausgesetzt freilich, daß man aus diesen ‚Realitäten' kein Dogma mache ---". Gottfried Martin, in like vein, writes in his work on Kant's theory of science:[47]

> This renunciation of the knowledge of essence and the limitation to relations constitutes the peculiar pathos of modern natural science and was also expressed convincingly by Kant [i.e. with the „Ding an sich"].

Bertrand Russell similarly rejects materialism so long as it claims that all reality consists of "little hard lumps". True scientific materialism, he says, simply declares that all reality, including mind, is subject to physical laws:[48)]

> The important question is not whether matter consists of little hard lumps or of something else, but whether the course of nature is determined by the laws of physics.

And Popper supports the "methodological nominalists", who ask how matter behaves, and regard words only as useful means of description, against the "methodological essentialists", who ask such questions as "What is matter?" and "What is force?"[49)]

All this goes to show that Herder's qualitative concepts such as „Kraft" made it impossible for him to elaborate a theory of matter compatible either with the classical physics of his age, or with the more progressive hypotheses of contemporaries such as Boscovich, or with modern scientific usage.

b) Force and energy in the physical world.

Noll[50)] briefly denies that Herder's „Kraft" has any similarity to the „Kraft" (i.e. force) of modern mechanics. F. Berger holds the same view, rightly observing that Herder's „Kraft" is equivalent neither to the force of acceleration nor to that of inertia.[51)] H. Schwarz,[52)] followed by Hoffart[53)] and Rouché,[54)] also concurs in this opinion, alleging that

physical forces become exhausted, whereas Herder's forces contrive to perform new tasks indefinitely. This, however, is not strictly accurate, since the conservation of force, as well as of energy, has long been accepted in physics; on the other hand, Herder's „Kräfte", lacking any definition in terms of such quantities as mass, velocity and distance, and retaining, in the doctrine of „Palingenesie", a quasi-personal individuality throughout their transformations, are certainly very different from the forces of both classical and modern physics. Berger further correctly points out that Herder's „Kraft" cannot be compared with modern energy, since it is not mathematically (quantitatively) measurable, but constitutes, in Herder's words, the „Maß der Realität eines Daseins von innen".[55]

Undeterred by such considerations, Clark[56] shows how Herder borrowed the word "Energy" from Harris, who distinguished it from Power, and quotes Kluge's „Etymologisches Wörterbuch" in claiming that Herder introduced the word „Energie" in its modern, scientific sense into German. But firstly, there is no evidence to show that Herder had read the work ("Philosophical Arrangements") in which Harris made the distinction between Power (as potential force) and Energy (as active force), although the word „Energie", without this definition, appears in Harris' "Three Treatises", read and quoted by Herder in the 1760's; besides, Harris made no attempt to relate his conceptions to physics. Secondly, the reference to Herder's „Energie", supported by Kluge, as the first example of the modern scientific usage of the term, can scarcely be reconciled with Clark's subsequent statement that Herder's „Kraft", not his „Energie", corresponds to our modern "energy". And thirdly, Herder never uses the word „Energie" in the way in which it is used in modern science, as Kluge infers, for it is never quantitative, but

is employed, for example, to describe man's soul as an „Abdruck göttlicher Energie"[57] (in 1778), and to describe the natural divisions of the world as arising „zufolge der ihm [i.e. jedem Theil der Welt] einwohnenden Natur= oder göttlichen Energieen"[58] (in 1787). For Herder, like Harris, always uses the word in an aesthetic (c.f. Schiller's „energische Schönheit"), religious or metaphysical sense.

Clark soon drops the comparison between Herder's „Energie" and modern energy, and goes on to say:[59]

> Above all, if we can equate Herder's „Kraft" with modern energy - and to do so would be doing no violence to either - it is startling to notice how he places energy at the center [sic] of all physics, i.e. of all science.

He further says of Herder's „Kraft": "If it is purely metaphysical, then most of modern physics is also metaphysical",[60] and excuses Herder's vagueness and his inability to define „Kraft" coherently by showing[61] how physicists in Herder's age could not decide whether the product of mass and velocity (mv - our measure of simple mechanical motion) or of mass and the square of velocity (mv^2 - our measure of mechanical motion in its capacity to do work, i.e. of kinetic energy[62]) should be the measure of motion (or of force, still not clearly distinguished from energy at this time).

In the passage quoted by Clark as an example of Herder's pardonable vagueness, Herder says of the word „Kraft": „--- wer weiß, was es, inwendig der Sache selbst, bedeute?"[63] But in this, as in all similar utterances, Herder is not voicing doubts concerning the quantitative measure (whether mv or mv^2) by which physical force (not energy, for he nowhere mentions any quantitative formulae comparable with those by which potential and kinetic energy were defined in 19th century physics) could be defined; he is simply echoing the current truism, which, as we noticed initially, he nevertheless

violates on other occasions by reducing „Kraft" to various animistic or even material agencies, that the intrinsic quality of „Kraft" may be unknowable. Thus, the cause of Herder's uncertainty is not to be found among the disputes of contemporary physicists over mathematical formulae; his doubts are purely metaphysical.

But Clark says that most of modern physics is just as metaphysical as Herder's „Kraft". It is indeed true to say that physics makes no claim to know the intrinsic nature of energy, or, for that matter, of force. But this does not mean that they are metaphysical concepts as used in science, because the aspects of them with which physics is exclusively concerned are the measurable changes observed in the physical world; the metaphysical reality, non-reality, or nature of energy as a „Ding an sich" is a matter of total indifference to the physicist. In mechanics, terms such as "energy" can be used not only quantitatively to describe observed changes, but can even be used (more questionably, from the point of view of philosophy), to describe the causes of these changes, without prejudicing the accuracy of scientific results. But there is the risk that they may pass into other sciences such as biology, where they tend to acquire a quasi-substantial reality, distinct from the observed effects with which they were originally associated. As Engels says of force: "--- in every natural science, even in mechanics, it is always an advance if the word force can somehow be got rid of."[64)]

In conclusion, let us briefly review the stages through which the conception of force has passed in physical science. (We can now leave the modern conception of energy, since it had no unambiguous function in the science of Herder's day, least of all in Herder's works.) This should help us to judge whether Herder's versions were behind or in advance of those of

his age.

Leonardo wrote in his notebooks:[65]

> Weight is corporeal and force is incorporeal.
> Weight is material and force is spiritual.

Jammer records of Newton's theory:[66]

> Force, for Newton, was a concept given a priori, intuitively, and ultimately in analogy to human muscular force.

Nonetheless, though Newton engaged in private theological and metaphysical speculations upon the intrinsic character of force, he allowed only its quantitative aspects to enter into his scientific arguments. Not long before Herder wrote, there were published various works by Boscovich, whom Herder had studied to some degree. Boscovich, as we earlier saw, regarded the intrinsic nature of force as irrelevant to physics, using the word to signify a mathematically determinable relation;[67] his views have been inherited by modern science. On a more philosophical level, Berkeley[68] had earlier supported the same view, and it was later proclaimed anew by such scientific theorists as Ernst Mach, Kirchhoff, and Hertz.[69]

Theories like that of Leonardo concerning the spiritual nature of force are merely instances of what Whitehead calls "the fallacy of misplaced concreteness";[70] it is easy to allow what is merely a word, a model describing a set of relations, to acquire a substantial content of its own. Herder's theory is closer to that which Leonardo had inherited from the Middle Ages than to those of modern physics. It is even inferior to that of Newton, who used force only as a measurable quantity, unlike Herder, who, when applying the term to the physical world, did not even begin to free it from a mass of extraneous associations. In fact, it was this very wealth

of association which enabled him to use the idea as he did, as a great unifying concept. Boscovich's advanced conceptions had been put forward in 1758, before Herder began to write, but Herder does not appear to have benefited from them either.

c) The conservation of energy, force and mass.

In the „Ideen", Herder argues that, since the „Kraft" of which the soul consists, like all „Kräfte", is indestructible, the soul must be immortal.[71] This idea inspired the critic Posadzy to speak of the „Gesetz von der Erhaltung der Kraft" in Herder's work.[72] Hansen[73] also alleges that Herder attains to „den Gedanken an eine Erhaltung der Kraft und des Stoffes", referring to Herder's statement „[daß] die lebendigen Kräfte mit Organisationen beschränkt und wieder befreiet werden",[74] and Vielhaber declares that he reaches „das Gesetz von der Erhaltung der Kraft und des Stoffes" by intuition.[75] Clark says that Herder observes the law of the conservation of force,[76] and Siegel declares that Herder's principle of „Kompensation" can be compared „mit unserem modernen Energieprinzip."[77]

Now we have seen that Herder's force is nowhere equivalent to the force whose conservation was proved in 19th century mechanical physics by mathematical theory and experiment, in the work of Robert Mayer, Helmholtz and others. His theory that the individual „Kräfte" behind all organisms are conserved is never extended to include all forces in the universe, physical as well as biological ones. The "proof" of the theory is that we can never see a „Kraft" perish;[78] we might add that we can never see a „Kraft" at all. All this is in no way comparable with modern scientific theories, as several critics have claimed. The same objections render void any comparison of Herder's ideas with the law of the conservation of energy. And, so far as

the notion of the conservation of mass (or matter) is concerned, we may recall that Herder's theory of matter is completely vague and imperfectly resolved; furthermore, he rejected Kant's theory „von einem allgemeinen, nie vermehrten, nie verminderten Quanto aller Substanzen" in his „Metakritik", on the grounds that such a principle can never be verified.[79)]

What then do early non-mathematical, non-experimental conservation theories such as Herder's signify? Above all, they do not adumbrate modern scientific theories in a marvellous or inspired fashion. They are ultimately derived from the holistic premise that since the universe, the organism, etc. are all complete wholes, the quantity of their constituents must be constant overall, and changes to them can only take place by rearrangement of their parts. Such are Herder's principle of „Kompensation", Spinoza's "suum esse conservare",[80)] and Leibniz's principle of plenitude.

On a more scientific and empirical level this a priori deduction is expressed in the dictum of Lucretius, noted by Herder in the 1760's, that nothing can be completely destroyed, since something new must always arise out of it.[81)] The same assumption lies behind man's use of (presumably constant) weights from the earliest times. All this implies that matter, or rather mass, is conserved throughout all changes. Bacon enunciated this principle,[82)] and it soon became an axiom of the new, quantitative chemistry of Boyle, Black and others.[83)] As Singer remarks, a belief in the conservation of matter, and even of energy, had already been at least implicit in Galileo's quantitative mechanics.[84)] Newton's laws of motion entail the law of the conservation of momentum, as a writer on Newton's science observes.[85)] Descartes enunciated the principle of the conservation of motion,[86)] which leads directly to that of the conservation of force. Leibniz's physical theory of vis viva (our kinetic energy) even implied the

law of the conservation of energy, as Sir James Jeans points out.[87] Kant, in his early essay on physical „Kraft", also notes that Leibniz accepted the Cartesian principle „daß sich in der Welt immer einerlei Größe der Kraft erhalte."[88]

Thus, although the more philosophical conservation theories were based only upon a priori reasoning, or religious guarantees of permanence (which could be construed as heretical, since they imply that the universe is eternal), and although, in science, they were proved[89] to be valid as universal laws only in the 19th century, by Mayer, Joule and others, they had already been applied in a much more practical, empirical and quantitative way than they are in Herder's works, from a time long before Herder began to write. Once more, attempts to prove that Herder's scientific results were strikingly modern are seen to be completely misguided; they indicate a wholesale disregard for the way in which scientific methods have developed. The true ancestors of our modern scientists are those who discovered and practised their methods.

d) Mechanism and dynamism.

In his „Erläuterungen zum Neuen Testament" (1774-75), Herder declares:[90]

> Die unsichtbare Welt ist uns endlich ganz verschlossen, weil wir Mechanisch denken.

This is but one of numerous similar utterances. We noticed how Herder, in his fourth „Kritisches Wäldchen" of 1769, had already begun to doubt whether "mechanical" physics can inform us, for example, about our subjective sensations of sound, although he put forward other more or less mechanistic theories himself in the same year. From this time onwards, however, the psychology of feeling tends to replace mechanical analysis for Herder, and

„Kräfte" increasingly supplant "dead" matter as the subjective and objective poles of the world studied by science; thenceforth, he repeatedly attacks "mechanistic" theories of nature.

One modern theorist enumerates seven meanings of the term "mechanism".[91] We have already discussed one of these senses in evaluating the place of "mechanistic" as opposed to teleological ideas in Herder's works. A second sense, whereby "mechanism" is opposed to dynamism, the belief that omnipresent forces exist throughout the physical world in their own right, not merely as functions of the mechanics of motion, will now be examined.

We have seen how Herder, like the early Kant, replaced Lucretius' moving atoms by dynamic „Kräfte" in his cosmogony, even in the 1769 manuscript recently published by Irmscher. Nonetheless, his „Kräfte" create orderly forms by an interaction which can, in itself, be described as mechanical (i.e. not teleological). Similarly, in retaining the concept of matter, as well as that of „Kraft", Herder often combines mechanism and dynamism, adopting an intermediate position, as usual.

But the term "mechanism", as used in the present section, denotes the belief that the laws of motion, operating within an inert matter, can fully explain how all observed nature is created and sustained. How then do Herder's dynamistic „Kräfte" alter such a picture of the universe? In attempting to answer this question, we hope to bring out the remaining few implications of the „Kraft" conception for Herder's views on the physical world.

Firstly, „Kräfte" often simply add a dimension of inwardness to an otherwise "dead" universe, as F. Berger[92] and Bruntsch[93] have realised. The forces of simple mechanical motion are assumed to produce all movements

from outside, by external impact, in elementary mechanics. But the search for an internal cause of motion in the physical world, by analogy with the "spontaneous" motions of man, helped to produce emotionally conceived, dynamistic theories such as that of Herder, who could not by nature accept the inert and passive universe of mechanistic materialism.

The second feature we observe in Herder's physical dynamism is that it introduces an ever-present principle of development whereby „Kräfte" operate, as hypothetical motive impulses, from within an ever-changing universe. This is that philosophical dynamism which Boucke, in his excellent work on Goethe, traces from Heraclitus down to the eighteenth century.[94] It reminds us of Herder's so-called „Entwicklungsgedanke", which we have already discussed. Such ideas had appeared, usually in idealistic forms, with increasing frequency from the Renaissance onwards, but were becoming more naturalistic around the time of Herder. However, he still clung to many of their metaphysical associations. As F.M. Barnard rightly says:[95]

Die Quelle des Wirkens ist mit Herders Konzeption von Kraft identisch.

But, as we earlier remarked, the value of Herder's dynamistic idea of universal development lay not in the „Kräfte" which provided the theoretical impulse, but in the formal aspects of natural changes which he described by the dialectical formula, his theory of natural law, etc.

Thirdly, this doctrine of development could be implemented upon a more concrete, physical level, giving the conception that everything in the physical world is in a state of perpetual motion. Herder quotes the following sentence from Leibniz's writings, which in turn refer to Boyle:[96]

Eine Substanz kann nie ohne Handlung, ein Körper nie ohne Bewegung seyn.

Leibniz believed that rest was only a particular, infinitesimally small degree

of motion.[97] Kant, more empirically, had said that everything is in motion, in gravitational orbits, in the astronomical universe.[98] We know from his „Allgemeine Naturgeschichte" that he believed, at that time, that such motion was caused by dynamistic „Kräfte", just as Leibniz had done. But Kant soon overcame Leibniz's rather contrived theory that rest is a form of motion, even before his critical period. Already in 1758, three years after writing the „Allgemeine Naturgeschichte", he called „Kraft" „das Gesetz einer durch die Erfahrung erkannten allgemeinen Erscheinung, wovon man die Ursache nicht weiß",[99] making its existence verifiable only in cases of observed motions. Like Boscovich, Kant eventually succeeded in using the conception of „Kraft" descriptively, without substantivising it as Herder so often did. The idea of perpetual motion was forced upon Leibniz's scientific thought by his metaphysical doctrines. Herder, who declared in his „Gott" that even matter is a form of „Kraft", seems, unlike Kant, Boscovich and others, never to have gone beyond the Leibnizian theory.

The fourth function of dynamism in the physical theory of Herder's age was to provide, within science, an alternative to mechanistic theories of impact or impetus. For the laws of motion, as phrased by Descartes and other pre-Newtonian thinkers, meant that inert masses of matter could only be moved by direct external impact. Newton realised, however, that gravitation is proportional not to the surface, as required by a theory of direct impact, but to the mass of a body.[100] Newton therefore propounded the theory that a gravitational force, of unknown nature, is at work; completely breaking with mechanistic impact theories, he dismissed Descartes' hypothesis that space is filled with an ether, the swirling motion of which produces gravitational phenomena by direct pressure upon bodies. Newton's hotly disputed

theory of "action at a distance" admirably described the observed phenomena, but created methodological difficulties, and opened the way for a more extreme dynamism such as that of Herder, who supposed that unseen but substantial forces, different from the forces of "impact" mechanics, governed the physical world. It was Newton's theory of gravity which was to give to much of eighteenth century physics a more mystical tone than that of the apparently more down-to-earth mechanical physics of Galileo and Descartes.

However, in his theory of simple mechanical motion, Newton retained the idea of impact. An initial impact could set a body into motion, which persisted uniformly in a straight line until the body was acted upon by some other force.[101] (Newton did, however, reject the Aristotelian and medieval notion that a mover [movens] must be in constant contact with the moving body [mobile] throughout the duration of its motion.) Boscovich, however, reduced all forces, including those of simple mechanical motion, to "action at a distance" (between atoms consisting of mathematical points with surrounding miniature "gravitational" fields), and thus used Newton's theory of gravity to eliminate the concept of impact altogether from his mechanics. The development of electromagnetism in the nineteenth century caused more and more phenomena to be explained in such a "dynamistic" way, without the idea of impact, thus extending Newton's method of explaining gravity.

But after all, as Dalberg said:[102]

> Wissen die Herren wohl mehr, was Impulsion ist, als sie das wissen, was Attraction ist?

This view is shared by a present-day historian of the concept of force:[103]

> It is pure prejudice to assume that action at contiguity is more intelligible than action at a distance.

No doubt this prejudice arises because we associate the tactile sensation of contact with applying our muscular force to any external body. But this does not justify us in carrying this experience beyond ourselves as an analogy. Thus, it is a fallacy, but a common one, to believe that the French materialists of Descartes' school were scientifically and methodologically more correct than physicists who, like Newton and Boscovich, put forward (albeit carefully qualified) dynamistic views.

The only scientific argument which can justify dynamism is Newton's. For Newton's gravitational force, or any electromagnetic force, can be used as a hypothetical construction, so long as it does not lead to metaphysical speculations on the inner nature of the forces. The three other senses in which we have used the term - as "inwardness", as the „Entwicklungsgedanke" and as the doctrine of perpetual motion, have no place in recognised theories of the physical world.

However, Herder found even Newton's theory of gravity, and Kant's early (teleological) creative forces too mechanistic in his last years, as we shall see, apparently preferring the archaic, animistic forces of Kepler.[104] In this, and in the three previous cases discussed, he went beyond the qualified dynamism which uses „Kraft" only as a hypothesis. His dynamism is predominantly intuitive and metaphysical, not scientific or even pragmatic.

Nonetheless, traditional mechanism, as expounded by Descartes, had proved inadequate in physics, especially in the theory of gravitation; Herder's objections to Cartesian mechanism are largely justified for this reason alone. Even the Lucretian Knebel did not accept Lucretius' crude mechanism of endless impacts between solid, inert atoms.[105] In Newton's wake a whole wave of dynamism arose. Among the dynamists of Herder's age

were Diderot, Reimarus, and his friend Einsiedel, as well as more mystical exponents such as Swedenborg. From the first three names alone, it is clear that dynamism was something more than a theological or even mystical revolt against "materialistic" physics. It was also an attempt to build a naturalistic picture of nature upon a theory which had successfully overcome some of the weaknesses of earlier mechanics, and which, stressing as it did the all-pervading, immanent forces of movement and change, was emotionally satisfying to a new generation whose temper was more progressive, revolutionary, and even romantic, than that of its predecessors.

e) Theories of "ether" and universal media.

The propagation of sound as a disturbance within the medium of air, and of light (according to Huygens and Euler) within the hypothetical medium of ether, were ideas generally known in Herder's day. Since Herder himself often treated sound and light as „Kräfte" operating within a medium, it followed for him that his many other „Kräfte" likewise required some medium within which to operate.

Accordingly, in his basic metaphysical triad of „Raum", „Zeit" and „Kraft", he considered that space and time were media within which „Kräfte" acted.[106] He was led by the same considerations to suppose that organic „Kräfte" must work within an „Organ",[107] and thereby reinstated that inert matter, with its concomitant dualism, which, as we have seen, he rejected elsewhere. But the numerous physical „Kräfte" act not only in matter; in the „Ideen", Herder declares that air is „das all=verbindende Vehiculum der Schöpfung",[108] within which many known and unknown forces work. He borrowed this notion from J.F. Gmelin's work on air,[109] as well as from that of the chemist Candido Pistoi, from whose work he had excerpted the

words: „d[ie] Luft dient d[en] andr[en] Elem[enten] z[um] Träger" (in his unpublished notes).[110] However, the particular physical "force" of light requires the special medium of ether, as Herder repeats after Euler and Bode,[111] whose theories he knew, in a letter of 1772 to Lavater.[112] In the unpublished manuscript „Anfangsgründe der Sternkunde" of 1765, he already says that the stars move „im Aether herum", and that this ether can even hinder the earth slightly in its motion. (This implies that the ether is a material medium.)[113] In another passage quoted by Schmidt-Cürtow, he suggests more sweepingly that ether is „der himmlische Feuerstrom, durch dessen Vehiculum vielleicht alle Kräfte hienieden wirken."[114]

However, the physical agencies of light and sound do not only act within other media (ether and air). They are themselves the „Medien" within which our senses of sight and hearing function, Herder writes in his 1778 essay on psychology.[115] And again in his „Gott", he says that all „Kräfte" must have a medium, and that the media for the basic physical forces are themselves „Kräfte" (not subtle material ethers, etc.):[115a]

> --- und welches könnte bei diesen die Materie ausmachenden Kräften ein solches Medium seyn, als die Kräfte der Substanzen selbst, mit denen sie auf einander wirken?

By dispensing with inert matter, Herder is here forced to make „Kräfte" the medium of other „Kräfte". He ought to have realised at this point either that he should discard the idea of a medium as redundant, reducing everything to „Kraft", or that he should have kept the traditional idea of a subtle material medium, within which „Kräfte" could act. Candido Pistoi's theory of air as a universal medium ran into similar difficulties; his translator, in a spirit of compromise which is as understandable as it is unscientific,

added the note that air is „sowohl eines körperlichen als geistlichen [sic] Wesens theilhaftig",[116] and subsequently identified air with ether.[117] Where „Kraft" and medium are of a like kind (in Herder's case, both are „Kräfte"), an indefinite number of media or ethers is required, each one transmitting another; Euler boldly accepted this logical consequence, and postulated "a series of fluids, one always more subtile than another, and which are perfectly balanced together."[118]

Herder also used the conception of a "medium" in biology and psychology, and confusion again resulted. Many writers, as Haller remarks in his shorter manual of physiology,[119] had used the idea of an imponderable ethereal substance to explain phenomena in neurology, and even to define life itself. Lamarck indeed later defined life as "ethereal fire".[119a] Herder, in a well known passage from the „Ideen", likewise writes:[120]

> In den tiefsten Abgründen des Werdens, wo wir keimendes Leben sehen, werden wir das unerforschte und so wirksame Element gewahr, das wir mit den unvollkommenen Namen Licht, Aether, Lebenswärme benennen und das vielleicht das Sensorium des Allerschaffenden ist, dadurch er alles belebet, alles erwärmet.

Here, light (usually treated as a „Kraft" by Herder) and ether (traditionally, a subtle material substance) are confused, and the words „Element" (implying a substance) and „Sensorium" (a medium for sensation) merely add to the obscurity of the passage. Physical and biological terms are not in any way distinguished, nor are „Kräfte" clearly separated from the media within which they supposedly act. Herder had introduced the whole passage as a description of „das Medium, --- in dem alle Kräfte der Schöpfung wirken."[121]

Life and mind, Herder already says in 1778, operate within, or are even identical with this Protean "inner ether":[122]

> Dieser innere Aether muß nicht Licht, Schall, Duft seyn, aber er muß alles empfangen und in sich verwandeln können. Er kann dem Kopfe Licht, dem Herzen Reiz werden; er muß also ihrer Natur seyn, oder zunächst an sie gränzen. Ein Gedanke und Flammenstrom gießt sich vom Kopf zum Herzen.

In the „Ideen", he once calls it „der ätherische oder elektrische Strom",[123] saying that it is the one common „Principium des Lebens" in plants, animals, and, in more refined form, in the nerves and mind of man, where it becomes „das Medium der Empfindung".[124] Once again, it is unclear whether it constitutes life in itself, whether it is merely a medium for some other „Kraft", or whether it is itself material, hyper-physical, or both. In fact, it can be likened, not unfairly, to the Philosophers' Stone.

The idea of a „Medium" is put to yet another use in the 1775 version of the essay on psychology, in which language is called the „Medium" of thought.[125] And finally, the medium in which the soul (whose nature is „Kraft") passes on to a new „Organ" in a higher existence, is once more ether.[126]

All this shows how multifarious and involved are Herder's applications of the medium and ether theories. Rouché[127] claims that passages in Shaftesbury, and such mystics as Böhme and Oetinger, were the sources of Herder's conception. In fact, Shaftesbury, in the principal passage to which Rouché alludes, speaks of an "invisible ethereal Substance", then likens it to the "element" of Fire, mentioning light in the same context;[128] he does not distinguish it from the divine force he names elsewhere.[129] But Herder, as we have seen, mentions ether as a substance permeating space in the astronomy notes of 1765 for his classes in Riga (i.e. in a purely scientific context), and repeats this idea, referring to the scientists Euler and Boscovich, in his letter to Lavater in 1772. Later, he confuses

the medium within which „Kräfte" operate with the „Kräfte" themselves, as we observed; it is probable that Shaftesbury, who regarded ether in itself as a life-giving substance, may have influenced him here, so that he confused Shaftesbury's vital ethereal substance with the scientific hypothesis of a subtle material medium, and in turn, with his own conception of vital „Kräfte".

However, other sources were known to Herder, and they doubtless helped to add to the confusion. Bonnet considered that ether provided a new spiritual medium or body for the soul in the life hereafter, just as Herder, who knew Bonnet's writings, later did.[130] Friedrich Hoffmann, the famous physician of Halle whom Herder mentions in the „Journal",[131] defined life as a subtle substance, a „Nervenäther" (but not a "medium") which circulates in the nerves;[132] Mesmer later adopted this idea. Besides, science had used the idea to provide a medium for many forces, as in Huygens' and Euler's theories of light, and had also, as Newton sometimes did, defined various unknown forces as manifestations of subtle (presumably non-material) "aethereal spirits" within a common (presumably material), universal ether.[133] Ethers could thus be either mechanistic transmitters of motion, as also in Hartley's and Condillac's theory that thoughts are "modifications of the ether",[134] or unknown, dynamistic and immaterial agents, as in Newton's notion of "aethereal spirits", or even both, as in Pistoi's theory of elemental air, and Herder's conception of ether. And finally, ether played an important part in mystical, usually pantheistic philosophies, from the Stoic idea of "pneuma" and the Pythagorean belief in moist, cold, etc. ethers,[135] to Lavater's[136] and Bonnet's ethereal bodies of the afterlife, and, of course, those other mystical applications such as Shaftesbury's, as named by Rouché.

We conclude that Rouché names too limited a source for Herder's many-sided idea, that he fails to distinguish Herder's „Kräfte" from the (originally distinct) idea of an ether or medium, and that he does not indicate how full of different associations, both scientific and mystical (but not theological), this paradoxical conception was.

Thus, „Kräfte", for Herder, can, by implication, be either material or immaterial, they can be their own medium, they can act without a medium, or they can have as a medium various forms of ether; this ether itself, by implication, can be material or immaterial, or both, or of an unspecified composition, and can perform functions usually reserved for physical, biological, or psychological „Kräfte". The whole idea, as used by Herder, is therefore hopelessly confused. It mirrors, with added complexity, his ambiguous conceptions of matter and force.

We have seen that the ether theory, although often used in physical science until the late nineteenth century, is not so frequently used in traditional scientific senses by Herder. Perhaps he conceived an antipathy for such applications since they were associated with Descartes' mechanistic theory of gravity. As in Hoffmann's writings, "ether" is more often simply another guise for biological vitalism.

f) Space and time.

For Herder, space and time are empirical conditions of existence, and are therefore relative to our experience of the objective world. We acquire our knowledge of space by observing that objects, including ourselves, though existing separately, may be juxtaposed. We achieve our conception of time by observing that movements and changes take place around us.[137] Time, however, is relative not only to the external objects from which we

abstract our idea of it,[138] but also to our (presumably emotional) subjective state at any particular moment.[139] Thus, in his „Metakritik", Herder rejected Kant's theory, enunciated in the „Kritik der reinen Vernunft", that space and time are absolute, a priori „Anschauungen", imposed by the mind itself upon external reality. For Kant, they are subjectively conditioned only in the sense that they are determined universally by the constant attributes of the human understanding, not by the subjective (i.e. emotional) state of the individual.

Yet it is interesting to compare the following two utterances, the first from Herder's essay on Shakespeare, and the second from Kant's early „Allgemeine Naturgeschichte":

> Hast du nie gefühlt ---, wie es blos an dieser Seele liege, sich Raum, Welt und Zeitmaaß zu schaffen, wie und wo sie will? 140)
>
> Daher eben dieselbe Zeit, die für eine Art der Geschöpfe gleichsam nur ein Augenblick ist, für andere eine lange Periode sein kann. 141)

In both cases, time (and also space for Herder, on this occasion) is seen as relative to the subject. But already, Herder here believes that time is relative to subjective <u>emotions</u> („gefühlt", „Seele"), presumably of the individual, whereas Kant declares, more abstractly, that it is relative to the constant mental equipment of each entire species.

In his „Gott", however, Herder departs from his usual view, and declares:[142]

> Ist nicht der Raum, ist nicht die Zeit Endlos?

This implies that space and time have an absolute, independent existence in themselves (and, incidentally, suggests the heretical doctrine that time is

infinite). Again, in his dialogue „Voraussicht und Zurücksicht" of 1795, he calls time „die große Mutter der Dinge",[143] thus reminding us of Greek mythology and of Goethe's poem „Prometheus". In a sermon of 1775, however, he upholds the orthodox religious doctrine, calling time „ein kleines spannenlanges Bild der Ewigkeit".[144] On another occasion in his „Gott", he reaffirms his more usual idea that „Raum und Zeit sind nur Phantome unsrer Einbildungskraft",[145] without, however, adding the complementary statement, as he does in the „Metakritik", that they are also relative to our objective, empirical experience.

In science, Herder's theory of space and time is the empirical one; space and time are the media within which „Kraft" manifests itself, and which we abstract from external objects as a means of measurement.[146] He enters into no further attempts to define time and space as used in science, but it seems, from his statement in his „Gott" that time and space are "endless", that he did regard cosmic time and space as existing independently, and as infinite in duration and extent. Since the age of Newton, cosmic space had been regarded as infinite by most thinkers.[147] Theories of time were more varied, since they were complicated by theological considerations. But in Herder's thought, as Barnard remarks, both time and space are secondary in importance to the idea of „Kraft".[148]

Conclusion.

Herder's views on the general nature and structure of the physical world are incorrigibly vague and ambiguous. This ambiguity, we shall shortly see, prejudiced the value of many of his theories within the particular branches of physical science. Once again, we conclude that the

conception of „Kraft" was responsible for most of the deficiencies in his scientific thought.

2. Astronomy and the theory of gravity.

a) Astronomy.

The forerunner of astronomy was astrology, of which there are traces in Herder's „Ideen". He writes, for example:[149]

Unsre Erde ist --- im Conflict mehrerer himmlischen Sterne.

This could refer simply to conflicting gravitational attractions, but the mode of expression is suspiciously reminiscent of that found in astrological literature. Herder also believes that meteorological changes, like the oceanic tides, are caused by extra-terrestrial influences, and he says that the progress of meteorology will reinstate „die Astrologie aufs neue in der ruhmwürdigsten nützlichsten Gestalt unter unsern Wissenschaften".[150] He even declares that important changes in history may have been produced by the influences of similar unknown „Kräfte" working within the atmosphere.[151] No critics, it seems, have remarked upon these statements; Goethe's condemnation of all astrology, especially in meteorology, may possibly have been written (in 1825) with Herder's words in mind.[152]

Herder was interested in astronomy throughout his life. He mentions over thirty writers on the subject in his works,[153] and his library contained further works which he does not cite.[154] He often writes rhapsodically of the stars,[155] thus showing that the motives behind his love of astronomy, as with many actual astronomers, included aesthetic and mystical admiration for the vastness and harmony of the stellar universe. G. Müller wrote, after Herder's death, that his spirit was perhaps „bei den Sternen, wo sein Auge und Gemüt so gerne weilte."[156]

But the unpublished manuscript „Anfangsgründe der Sternkunde",[157] based on notes made by a pupil in Herder's classes at Riga in 1765, shows that he had a full and accurate knowledge of scientific astronomy from an early date. The notes, 48 pages in length, contain a detailed description of the constellations with their main stars, systems of astronomical measurement, the numbers of stars according to contemporary catalogues and computations, the structure of the nebulae and the Milky Way, the planets and their satellites, the sun and sunspots, the moon and its surface, and eclipses; further statistics are added concerning the shape, size and structure of the earth. The remarks about the structure of our galaxy[158] clearly reflect Kant's „Allgemeine Naturgeschichte", to which, although it was withdrawn before publication and remained unknown for many years, Herder must have had access, perhaps through Kant's own assistance.

One interesting inaccuracy in the manuscript requires elucidating. The writer says: „--- es sind ihrer bishero 10 Trabanten der Venus." This is merely an error of dictation, because the sentence is incoherent throughout. But it is subsequently stated that Venus has <u>one</u> satellite.[159] Paradoxically, this statement, now known to be false, shows that Herder had paid careful attention to contemporary sources. For, among others in the seventeenth and eighteenth centuries, James Short in England and Cassini in Paris, both of whom Herder names, thought they had discerned a satellite of Venus. It is now thought to have been a "ghost" produced by refraction in the lenses of telescopes.[160]

Herder's interest in astronomy led to no further writings until 1776, when he wrote an essay, in the best Storm and Stress style, on Copernicus, for Wieland's „Teutsche Merkur". It is of little scientific interest, however, eulogising Copernicus rather as an inspired artist, a „Genie" of

the kind so esteemed in the 1770's, than as an astronomer as such. Although there is much to be said for this view of the great theorist, Herder's whole treatment shows that his purely scientific interest in astronomy has waned.

When he wrote his „Ideen", Herder was more preoccupied with biology and the study of man than with the physical sciences. His words on astronomy are stereotyped, and bear witness rather to his aesthetic pleasure at the harmony of the universe and the symmetry of the earth's mean position in the solar system than to his earlier scientific knowledge. Kant's influence is still apparent, and Rouché[161] enumerates several parallels, as Grundmann had previously done.[162] The influences of Bode, Kästner and Lambert are also apparent in some details of the text. We shall see in a later examination of the belief in planetary habitation how the idea that the galaxy, or even the universe, must revolve around some central body[163] comes originally from Kant and Wright, and how Herder and others use it to speculate, after the manner of Plotinus, upon the ultimate centre on which spiritual creation is focussed.

In 1787, Herder writes to Göttingen for a work on astronomy from the library there.[164] His unpublished notes contain excerpts from two articles by Herschel,[165] published late in 1784, i.e. after the part of the „Ideen" dealing with astronomy had been written. This indicates that his interest in the data of astronomy was increasing at this time; it reaches its height in the „Adrastea". But his aesthetic and mystical emotions also grow more intense as, older and disappointed, he turns away from the world around him to contemplate the eternal. In the remarkable account of a supposed dream or vision of the universe, entitled „Kalligenia", Herder says: „--- mir wars, als empfände ich hier Gottes=Gedanken, die Regel der Schöpfung, die Kepler mir in Harmonieen erklärte."[166] At this time, he had conceived a great

admiration for Kepler, as the prototype of the misunderstood German genius. No doubt he unconsciously identified himself with the great astronomer and mystic.

We shall examine Herder's late studies of the astronomical universe in the sections on the theory of gravity and the other branches of physics; for the present, we may note that he devoted a long section, in his „Adrastea", to the progress of physical science, and especially of astronomy, during the previous two centuries.

Finally, it is worth noting that Herder, as Rouché points out, followed Kant in accepting the idea of stellar or cosmic evolution. He writes in 1792:[167)]

> --- hat der allweite Raum sich zu Sternen und Sonnen aufgeklärt, und was Chaos war nach Gesetzen in daurende Bahnen geregelt.

In 1802, he again declares:[168)]

> Auch diese Sterne altern; --- Dagegen siehe jenen hellauf= glänzenden Brand, die Morgenröthe einer neuen Schöpfung, Orion.

Besides, we have earlier seen how Herder accepted Kant's "dialectical" theory of creation by gravitational forces. Similar statements, as we shall see in our section on cosmogony, appear in the „Ideen". But, in the „Adrastea", it is no longer to Kant that Herder refers for this idea, but to the works of practical astronomers such as Schröter[169)] and Herschel,[170)] which he had read in the 1790's in Bode's „Astronomische Jahrbücher".

We conclude that, while Herder had considerable knowledge of astronomy from an early date, he took the greatest interest in it, and thought most independently about it, in the last years of his life. His early knowledge was confined to exact scientific facts and to Kant's theory of cosmogony;

his later, more emotional interest is largely mystical and aesthetic. His later ideas, especially on gravity, as we shall see, are tainted by the animistic doctrines he had learnt through his earlier studies of biology. He contributed nothing of scientific value to the subject himself.

b) The theory of gravity.

Newton wrote of his gravitational force in a letter to Bentley:[171]

> --- whether this agent be material or immaterial, I have left to the consideration of my readers.

In his scientific writings, he wisely did not attempt to define its inner nature. Similarly, present-day theories of gravity are purely mathematical, and do not refer to intrinsic qualities.[172]

Herder, like many post-Newtonian thinkers, was not content with this; he frequently speculated on the intrinsic nature of gravitational attraction.

But first of all, let us note that, although Herder at some time or other acquired a copy of Newton's "Principia", and at least two works on the Newtonian theory of gravity,[173] he took his earliest formulation of the law from Kant's „Allgemeine Naturgeschichte", not directly from Newton. Compare the following two passages, the first from Herder's unpublished dictated notes on astronomy of 1765, the second from Kant's „Allgemeine Naturgeschichte":

> Die Bewegung der Erde um die Sonne setzt zwei Kräfte voraus: fortschiessende Kraft dadurch sie in jedem Punkt ihres Lauffs [sic] die gerade Richtung fortsetzen und sich ins Un[s]endliche entfernen würden [sic], 2 eine sinkende Kraft, die die vorige in jedem Punkt schwächet, --- und --- den Körper in einer krummen Gleise [sic] erhält. 174)

> Die Bewegung dieser Körper [i.e. the planets] --- setzt zwei Kräfte voraus --- nämlich eine schießende Kraft, dadurch sie

> in jedem Punkte ihres krummlinichten Laufes die gerade Richtung fortsetzen und sich ins Unendliche entfernen würden, wenn nicht eine andere Kraft --- sie beständig nöthigte diese zu verlassen und in einem krummen Gleise zu laufen. 175)

We have earlier seen how Herder often used the gravitational orbit as an analogy in social and ethical questions. This involves the "dialectical" idea that gravitation consists of two equally important components, the centrifugal force and the force of attraction, as in Kant's formulation of the law. Newton admitted that a centrifugal force existed (Herder's „fortschiessende Kraft"), but disregarded its origin, and treated it as governed by inertia, going on to state his law of gravity purely in terms of the one attracting, radial force. Earlier theories, such as the first of Kepler's various explanations of gravity, had stated that the centrifugal component of gravity is of great importance; it was seen as a tangential force, constantly impressed upon the orbiting planets as if by the invisible spokes of a wheel whose centre was the sun. This earlier theory was more "dialectical" than Newton's, therefore. Herder, as we know, was always fond of dialectical formulations. However, his late admiration for Kepler's animistic theory (which Kepler adopted as an alternative to the "spoke" or vortice theory), perhaps coupled with his aversion to Kant, led him to abandon not only Kant's "dialectical" theory, but even the Newtonian one, which had merely stated that a (relatively unimportant) centrifugal component is present in gravitation. Herder asks of the centrifugal force:[176]

> Und woher wäre sie kenntlich?

But what of the inner nature of gravitational attraction? Einsiedel believed that it might be a composite force,[177] and Herder, as Rouché[178] observes, used this idea in an early version of the „Ideen",[179] but

omitted it in the final version. However, he had himself earlier declared, in an empirical and Baconian spirit, that the law of gravity might simply be a very abstract, inductive generalisation, and that the reality of the "law" may lie entirely in individual, distinct phenomena.[180] This may be what Einsiedel meant with his "composite" force.

Hints of an animistic interpretation of gravity appear even in Herder's early writings. We have seen that he spoke of planetary souls in the 1769 manuscript which Irmscher recently published. This metaphysical, Leibnizian idea takes on a quasi-psychological colouring in the 1775 version of Herder's essay on psychology:[181]

> Selbst der Stein, wenn er durch innern Trieb fiele, müste seinen Trieb zum Mittelpunkt auf die dunkelste Weise erkennen, d.i. empfinden.

Similarly, in 1777, he says that the force of gravitational attraction may partake of the nature of „geistiger Kraft".[182] And in the „Ideen", he observes that the motion of a pendulum varies as gravitational attraction decreases at higher altitudes, then compares this known fact to the beneficial effects of mountain life upon man;[183] this implies that man may be constitutionally affected by small variations in gravity, so that the whole statement reminds us of occultist doctrines of animal magnetism, galvanism, and the like. However, the idea is perhaps only an echo of Kant's early theory that the inhabitants of the various planets are physically and mentally "lighter", and more highly developed, if they live on a planet more distant from the sun, the centre of gravity.[184]

As stated at the beginning of this chapter, it is probable that Herder, like Aristotle[185] and Linnæus,[186] allowed his earlier biological studies to affect his later theories of physical science. Thus, in 1797, in the

„Humanitäts=Briefe", Herder calls the earth „ein organisches Wesen", likening it to an orange („Pomeranze").[187] In preparing his „Adrastea", he studied Kepler's ideas, and there found support for his own animistic theories of gravity. Kepler had put forward various hypotheses on the nature of gravitational force at different times, but it was his archaic, animistic theory which appealed to the older Herder. He describes Kepler's doctrine, and contrasts it with the more guarded, purely mathematical formulation of Newton.[188] He calls Newton a „Glückessohn" who reaped the harvest sown by Kepler, and says that Kepler had discovered all the significant elements of the law of gravity himself.[189] And, elsewhere in the same work, he quotes a passage from Kästner's history of mathematics which alleges that Newton attempted, by a deception, to steal the laurels of Leibniz as discoverer of the differential calculus.[190]

Let us pause to consider the history of the animistic theory of gravity. Plato believed that the stars were animated,[191] as did Plotinus.[192] Gilbert's magnetic theory "de tellure sententia"[193] has much in common with Plato's, as have those of the other Renaissance thinkers Campanella,[194] Bruno,[195] and Montaigne.[196] Kepler early adopted the magnetic theory of gravity, saying that the tangential forces acted like a whirlpool or vortice, pushing round the planets as if by the spokes of an invisible wheel. But he also used the alternative, archaic theory that animating principles are active within each cosmic body, regulating its motions, before he elaborated the scientifically superior, mathematical conceptions of his later years,[197] and repudiated his earlier animistic theory.[198]

Herder, doubtless thinking of Kant, whose cosmogony he now (in the „Adrastea") unjustly rejected as thoroughly mechanistic and non-teleological,[199] denied that gravity could be a (dialectical) process of "blind" forces,

creating and sustaining the heavenly orbs. He does not dare to reject Newton's theory directly, but points out that Newton, though a teleologist, never defines the inner nature of gravitational attraction (as if this were a fault!). Formulae such as Newton's „in jedem Moment wesentlich behinderte Anziehung" are „nur Hülfsbrücken, Denkbilder des menschlichen Geistes", he maintains.[200] He further portrays the misfortunes of Kepler in a sympathetic light, contrasting his position with that of the „Glückessohn" Newton, as we have seen. He cites Kepler's animistic ideas in some detail,[201] concluding with the observation:[202]

> Er nahm also zu einer animalischen Kraft seine Zuflucht, mit der er Sonne, Erde und alle Planeten beseelte, wovon künftig die Rede seyn wird.

It seems probable, from these words, that he intended to try to justify Kepler's theories on some later occasion, but his promise is not fulfilled: they are never mentioned again.

Herder's half-concealed preference for Kepler's theory as against that of Newton can be seen as a milder version of the antipathy with which Goethe regarded Newton's theory of light. As we shall see, Goethe and Herder corresponded on theories of light and colour even at a time when they were becoming increasingly estranged from one another, and Goethe's colour theory influences certain passages in the „Adrastea".

The predilection for Kepler's archaic and mystical ideas is typical of the older, disillusioned Herder, and also of the new „Naturphilosophie" which was arising in those same years. Even the title („Weltseele") of one of Schelling's works recalls Kepler's early doctrine. We can perhaps detect Herder's influence when Goethe, in 1825, speaks of the „lebendigen

Erdkörper"[203] whose "breathing" causes meteorological changes. When Goethe, around 1829, suggests that mountain-masses may once have exerted a strong quasi-gravitational attraction, which caused stratified rocks to be uplifted, he seems to echo Herder's earlier belief that the Asian mountain massif attracted the most powerful, generative „Kräfte" in the early phases of the earth's development.[204]

We conclude that Herder's theories of gravity were closer to those of the „Naturphilosophen" than to the mathematical theories found in both Newtonian and present-day science. Like so many other ideas of his, this one was impaired by his metaphysical conception of „Kraft".

3. General physics.

a) Electricity and magnetism.

Although Herder once suggested that the „Kräfte" of life, electricity, motion and gravity may be reducible to some common origin,[205] we shall try to discover what distinct characteristics, if any, he attributed to electricity and magnetism in particular.

Hopeless confusion confronts us from the start. In the „Journal", the „elektrischer Funke, der das Schiff umfließt"[206] (identified by A. Gillies, probably correctly, as St. Elmo's fire[207]) is compared both to the aurora borealis and the earth's magnetic field. Similarly, in a note added to a poem he sends to Caroline in 1772, Herder says that the phosphorescence of the glow-worm is electrical in nature.[208] In a letter of the same year to Lavater, he identifies electricity with „Lichtäther", the medium of light.[209] In 1778 Herder mentions „der elektrische Strom" as a species of heat („Strom"

is an unwittingly prophetic word, since current electricity was still unknown at this time), and calls it „diese sonderbare Erscheinung des großen, all=gegenwärtigen Lebensgeistes".[210] As we noticed in our discussion of "ether" theories, Herder was by this time freely using physical „Kräfte", such as electricity and light, to describe biological phenomena. So it is with nervous reactions; he speaks of „der Elektrische Nervenstrom"[211] in 1775. (We now know, curiously enough, that nervous impulses are, in fact, electrical; but the doctrine of Herder's age was fanciful, and probably originated with Linneus, many of whose works were known to Herder - Linneus asserted that our nerves obtain their energy from "an electrical principle inhaled by the lungs",[212] and Bonnet similarly likened his hypothetical nervous „Lebensgeister" to electricity and light.[212a])

In the „Ideen", Herder no longer speaks of an electrical „Strom", but of an „elektrische Materie".[213] In the same work, light is likened to electricity, as when „die elektrische Sonne"[214] is mentioned. (The astronomer Bode, in a work which Herder had read, called the sun „eine feuerlose electrische Kugel".[215]) In the next part of the „Ideen", Herder calls electricity „der elektrische Feuerstrom",[216] again bringing heat or fire into his description. The elemental, creative „Kräfte" which operated in the atmosphere of the early earth included electrical ones, he believes.[217] Volcanic activity, with its associated explosions and conflagrations, may be connected with electricity, he likewise suggests around this time.[218] In an essay of 1785, the generative function of sexual union is likened to the electric spark.[219]

It is interesting to note that Herder underwent electrical treatment, which was very fashionable in that age, on at least two occasions in his life - in 1771 for toothache,[220] and in 1792 for pains in his leg.[221] The

treatment would consist of mild electric shocks.

It is seldom clear whether Herder is employing such ill-defined physical „Kräfte" as electricity merely as metaphors to describe unknown biological principles, or whether, in such contexts, he intends us to accept them literally. But we may blame the ignorance of science at that time concerning the nature and workings of electricity for much of the vagueness which surrounds the subject. For example, as late as in 1798, Herschel speaks of the „elektrischen Ausstrahlungen des Nordlichts", perhaps by analogy with lightning;[222] Herder, as we know, had made a similar observation. Franklin spoke of "electrical fire", calling it an "element".[223] Hauksbee, in the seventeenth century, had maintained that light is electrical.[224] Nollet, whom Herder mentions in the „Journal",[225] considered that heat and electricity were identical.[226] Sometimes electricity was called an "imponderable substance", at other times a fluid (hence Herder's „Strom"), and so on.[227] Since Herder possessed at least four works on electricity,[228] including Priestley's celebrated history of the subject, he probably met many such groping attempts to identify heat, light and electricity in the course of his reading. But his own desire to bring together many disparates under the common title of „Kräfte" must also be held responsible for much of his vagueness. However, in his „Gott", by way of exception, he very rightly says that we are not justified in equating electricity and magnetism just because they often appear to obey similar laws.[229] Schelling, however, was not deterred by such reflections, and later identified them, even making them responsible for the production of heat.[230]

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Like the science of his age, Herder knew more about magnetism than

electricity. Long extracts devoted to magnetism, especially from Euler, survive among his unpublished notes.[231] He had read works by Cassini,[232] Halley,[233] and Tobias Mayer[234] on the subject, and even sent (unsuccessfully) for the latter physicist's unpublished manuscripts on magnetism from Göttingen.[235] But, as with electricity, he is not content simply to record observed regularities and to try to arrange them under formal laws; he again speculates upon the inner nature of the phenomenon. (In extenuation, it must be said that most scientists of that age did the same.) Thus, he speaks of „der magnetische Strom" in the „Ideen".[236] This suggests Euler's influence.[237] Magnetic forces, he believes (doubtless by analogy with Kant's gravitational forces), may be the agents which create basic physical bodies,[238] and may even cause certain meteorological phenomena.[239] In a discarded sketch for the „Ideen" on the cataclysms of the early earth, he displays considerable knowledge of the earth's magnetic field and of magnetic variation, declination and deviation, but uses such facts unwarrantably to "prove" that the earth's axis has altered.[240] We have already seen that he had studied Brugmans' works on magnetism and magnetic polarity, and based some of his dialectical pseudo-laws upon them. Even in 1794, his interest in magnetism is still strong or even increasing, as a letter to Knebel, in which he asks for all available works on magnetism, proves.[241] We shall later see how he took a keen interest in galvanism and animal magnetism when these topics became current. The occultism endemic in such subjects would naturally appeal to him, since he regarded magnetism rather as another mysterious „Kraft" than as a series of observed regularities in the physical world.

b) Light.

Light, with its manifold associations, is a conception of paramount

importance throughout Herder's thought - and not only in scientific contexts. He names the triad of „Leben, Licht, Liebe" as „ursprüngliche Kräfte in der Welt",[242] and, like so many of his favourite „Kräfte", these are considered as both physical and spiritual realities. The same three words were engraved upon Herder's signet ring, and, after his death, upon his tombstone. (They may have had some connection with Freemasonry or the Illuminati, we may further conjecture.)

We noticed, while discussing the "genetic method", that the beginning of St. John's Gospel (together with the opening of Genesis) was Herder's favourite passage in the Bible. The apotheosis of light in those verses appealed to him profoundly. In his Bückeburg years, he again and again refers to the light-religion of Zoroaster as a commentary upon the New Testament. In the 1769 manuscript published by Irmscher, Herder, as we know, speaks of planetary souls. He adds:[243]

> Und also Gott, der die Sonne ist. Hat also Perser [sic] so unrecht, daß er die Sonne verehrt hat?

It is interesting that Kepler, whom Herder admired and resembled in many ways, especially in his later years, at one time seriously considered sun-worship as a form of religion. Herder, like many Platonic mystics, frequently alludes to the idea that God is the centre of the universe, or in some way related to the sun, as we shall later see. In a letter to Lavater in 1772, he calls light „ein Organ der Gottheit",[244] making it clear, however, that he is using the words figuratively.

Before examining the more scientific applications of the idea, we must first review the mass of half-scientific, half-symbolical uses to which the word "light" is put in the „Ideen".

Already in 1780, the young Georg Müller writes in his diary while

staying at Herder's house (and presumably under Herder's influence):[245]

> Luft-Licht-Wärme - diese drei sind Eines, wie der Geist, der Sohn, der Vater.

A similar mystical (if less theological) tone is sounded throughout the „Ideen" whenever light is mentioned. As we have seen, it is equated to electricity on one occasion.[246] It also acted as a purifying and creative "elemental fire", working within the other "elements", in the early, chaotic phases of earth history, when all the "elements" retained their pristine potency.[247]

We may here recall that the narrative of creation in the Book of Genesis included the words "Let there be light" before sun, moon and stars were created; this fostered the belief that there existed a subtle, "elemental" form of light, distinct from that of the sun, and that this perhaps acted as a secondary agent in the process of creation. This belief probably influenced Herder; for the conception of light as a creative "elemental fire" recurs several times in the „Ideen",[248] and one of these passages, in which „das Licht oder das Elementarfeuer" is named, illustrates our point particularly clearly. This "fire" supposedly purified the other, coarser elements, acting as „Auswirker der Schöpfung".[249] A propos of this "elemental" variety of light, we may note that the Ptolemaic cosmology envisaged a zone of invisible "elemental fire", which existed beyond the sphere of air.

At other times light is confused with ether,[250] as we earlier saw. In more scientific texts, ether, of course, appears only as a medium within which light is propagated as a disturbance. In other passages, light is related, or even equated to the principle which produces heat.[251] Like "ether", it is also used, in the same work, to describe the life-principle.

Indeed, as early as 1773 or 1774, Herder declared, in a sermon on the opening verses of St. John's Gospel: „das innigste Leben des Menschen ist Licht."[252] This theory is further worked out in the „Ideen", where he says of this life-giving light that it is: „kein Licht, das aus der Sonne kommt; ein Licht, das aus dem Innern dieser organischen Masse hervor= bricht."[253] The same "light" plays an integral part in animal reproduction.[254]

Thus, light appears in the „Ideen" not as an observed physical phenomenon, but as a mystical, even symbolic conception which, like "ether", often simply ministers to biological vitalism. Let us now pass on to the more scientific applications of light-theory.

It is only in his later period that Herder shows real interest in the theory of light as a distinct branch of physics, for as we have said, physics was the last branch of science to which he devoted his concentrated attention. However, he had acquired much general knowledge of the subject in his youth, and we shall first consider his early utterances on light and its nature.

The first informative statement appears in the unpublished manuscript on astronomy of 1765. The sun is described as follows:[255]

> Sie ist vermuthlich ein äusserst erhitzter Körper dessen Theile in schwingender Bewegung sind und der also entweder beständig auf das Licht wirket oder selbst einem glüenden [sic] Schmeltz= ofen voll dichter und flüssiger Theile daß [sic] Liecht ausschiesset.

(The pupil who wrote these notes from dictation, not Herder, is responsible for the bizarre orthography and syntax.) Here, both wave (undulatory) and emission (corpuscular) theories of light are suggested, and Herder does not discriminate in favour of either. The letter to Lavater in 1772 which we have often quoted contains a long statement concerning light.[256] (Herder

is criticising Lavater's use of light to describe the „Organ" of the immortal soul, and suggests that magnetism or some other „Kraft" might be a better symbol.) First, he says:

Das Licht z.E. ist durchaus Körper, denn - es springt ja zurück.

Here, he seems to support the emission theory. However, he next names Euler (among others) as a reliable authority on the subject, and says:

> Das Licht nämlich --- [ist] ein großer, überall ausgebreiteter Aether, den bloß die Sonne in Bewegung setzt ---

This is in accordance with Euler's wave hypothesis. Herder adds that such an inference does not follow „nach der alten Newtonischen [i.e. emission] Theorie." Thus, just as in 1765, Herder cites both theories, committing himself to neither of them.

We should note, however, that Herder was fond of wave theories in general, whether applied to water, air, or light, or to the "media" of the senses taken together, or even when used simply as an image. He says of man in his „Vom Geist der ebräischen Poesie":[257)]

> Er stehet in einem Meer lebendiger Wellen, und die Lebensquelle in ihm strömt und wirkt jenen entgegen.

Besides, he uses the theory of a universal "medium" or "ether" so frequently that he could not avoid the notion of waves. In the „Ideen" he speaks of „Lichttheile, die die Sonne nur anregt",[258)] and therefore seems to have preferred the wave theory of light around this time. A letter from Einsiedel in 1778, in which Einsiedel claims that Euler's theory is freer from contradictions than Newton's[259)] may perhaps have influenced his views at this time.

In the course of his astronomical studies for the „Adrastea", Herder encountered a new theory of light which especially attracted him, since it

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combined elements both of Newton's corpuscular theory and of the wave theory of Euler. He eagerly grasped at the idea, which, he says, was suggested by Herschel's and his own friend von Hahn's observations of the nebulae. These observations indicated that space might be filled with a kind of invisible light-ether which becomes visible as light whenever it comes into contact with a suitable surface, such as that of the sun or of the nebulae. It might even become visible to a lesser degree, through some sort of reflection, or, as yellow light, through contact with air, on the surface of dark bodies like the earth. Herder sums up the theory in 1802, in his „Adrastea":[260)]

> Ist die Sonne der große Lichterreger unsres Planetensystems, so kommt natürlich das Licht von ihr; an ihr wird es in größtem Glanz sichtbar. Sie darf aber es weder in Cartesischen Kugeln, noch in Cylindern herunterschiessen, die feine Materie, deren Zartheit nichts übertrift; diese kann sich nicht anders als Pfeilschnell in Linien uns offenbaren. Gegenseits: ist sie auflösend aus dem feinsten Aether gewonnen, so darf dieser nicht von der Sonne, als einer Glocke angeschlagen, vibriren und zittern. In sanften Strömen flößet das Licht sich fort, und findet allenthalben seinen homogenen Träger, die himmlische Aura, bis es in Nähe [sic] unsrer Erde sich mit Feuerkräften waffnet.

Thus, light is generated as a subtle material substance (as in the emission or corpuscular theory) derived from the universal ether, in which it is present in invisible form, and with which it is homogeneous. It is then transmitted by this ether (as in the wave theory).

We should observe that Herder believes that light and its medium are similar in nature. He ignores the difficulty which this presents, and which Euler had boldly faced, namely that if light requires a medium which is like itself, this medium, in turn, requires a further medium, and so on. (We

discussed this problem in our section on "ether".) Besides, while rejecting the theory that light is propagated as a vibratory wave disturbance („vibriren und zittern"), he leaves it unclear exactly how light can pass „Pfeilschnell in Linien" or „in sanften Strömen" as a uniform disturbance through the ether. He thus seems to accept the wave theory, but without the waves.

Beneath the surrounding light-substance, the sun (presumably along with the stars and perhaps the nebulae) has a dark, "planetary" surface.[261] This is connected with the idea of stellar habitation, as we shall later see.

In the eighteenth century, the emission or corpuscular theory of light enjoyed far greater prestige than the wave theory. This was largely because scientists believed that the great authority of Newton was on the side of the emission theory. In actual fact, Newton never finally decided between the rival theories, and, according to Sir James Jeans, "he usually wrote as though it began as corpuscles and ended as vibrations which the corpuscles had excited in an ether."[262] Herder, unlike most of his contemporaries, was therefore unwittingly supporting a theory similar to that of Newton himself but, of course, not comparable with Newton's in mathematical exactitude and careful observation. Herder's theory is scientifically worthless, because it does not explain how light reaches us, in waves or in lines, as a material substance "transmitted" by another substance, or as a disturbance in a medium. His failure to resolve the relationship between „Kräfte" and their media, earlier discussed, is responsible for this ambiguity.

The wave theory had been held by Leonardo,[263] but was first formulated more scientifically by Huygens and Euler; early in the nineteenth century, it was at last almost generally accepted, but, early in the present century,

both wave and emission theories were used, the one being found convenient for explaining certain phenomena, the other serving in the remaining cases. A new epoch began when the quantum theory replaced both.

It would be erroneous to say that Herder anticipated the dual theory used early in this century. He did not use the two theories alternately as working hypotheses, as happened in modern practice, but amalgamated the two into one. His innate desire for synthesis is again responsible. His final theory of light, suggested, as he says, by the observations of Herschel, von Hahn, Schröter and Bode[264] on luminous nebulae which could not be resolved into stars, should be seen as a scientific curiosity, an imaginative and ephemeral synthesis which, at first, seems to foreshadow the later pragmatic rapprochement which took place between the two theories.

However, it is remarkable that Schelling, as Haym remarks[265] (without giving sources, however), had also tried to reconcile the theories of Newton and Euler. In 1798, Herder had read Schelling's „Ideen zu einer Philosophie der Natur" and „Von der Weltseele", as a letter to Knebel testifies; „Sie müssen sie lesen", he writes to Knebel.[266] In his „Ideen" of 1797, Schelling regards the emission and wave theories as alike unsatisfactory, but seems to prefer the former.[267] But in his „Weltseele" of the following year, he writes:[268]

> Ich meinte, ob man die Newtonsche und Eulersche Theorie vom Licht nicht vereinigen könnte ---. Wer kann beweisen, daß nicht zwischen Erd' und Sonne eine Materie ausgegossen ist, die durch Wirkung der Sonne decomponirt wird, und könnten nicht diese Decompositionen bis in unsre Atmosphäre sich fortpflanzen, da in ihr selbst eine Quelle des Lichts ist?

He combines the idea of „eine eigenthümliche Lichtmaterie" with that of

„Erschütterung eines zersetzbaren Mediums."[269] Like Herder, he mentions Herschel in support of his views; the article in which Herschel suggested his theory of light-accretion around the nebulae[270] appeared in the same year as Schelling's work.

Herder's theory, propounded in 1802, is too similar to Schelling's not to have been influenced by it. Herder did not acknowledge his debt to the younger thinker, however, probably because he had come to detest him as a Romantic and follower of Kant (although Schelling, in fact, had been much influenced by Herder himself).

On the other hand, the idea that the sun has a dark "planetary" body surrounded by an extraneous „Lichtmaterie" appears in a work of Bode's[271] which Herder had read before he wrote the „Ideen".[272] Bode, whose work first appeared in 1768, postulated a light-substance „dessen feuerlose Stralen sich durch den Aether fortpflanzen", thus implicitly combining the corpuscular and emission theories in a way which distinctly foreshadows the theories of Schelling and Herder. Von Hahn, acknowledging Bode's precedent, also suggests, in a work written in 1792 and referred to by Herder in the „Adrastea"[273] in 1802, that light may collect round the sun, and speaks of „die Entwicklung der Lichtmaterie aus dem Raum",[274] just as Herder does. As early as 1610, Harriot had stated that the sun's light is merely a luminous envelope surrounding the sun's dark interior.[275] Herschel, in an article referred to by Herder in 1802,[276] had spoken (in 1798) of light as a „leuchtender Stoff" which accumulates around the sun and stars.[277]

From all this, we conclude that Herder probably first met the idea in Bode's book. He was greatly stimulated, however, by Schelling's theory which agrees with his own more closely than those of any other writers. The theories of Herschel and von Hahn, although much more empirical, probably

further strengthened Herder's conviction that the light emanated by the sun originates as a material substance. He cited the latter works rather than that of Schelling, perhaps assuring himself that his own views were sufficiently confirmed by the facts adduced by the astronomers. All of the writers named wrote in indefinite terms about the exact mode in which light, once produced, is transmitted, so that Herder's own vague theories of ether were not improved by their influence. But Schelling's influence proved really decisive, because he alone, before Herder, had explicitly attempted to reconcile the theories of Newton and Euler, whereas the astronomers had merely used an ad hoc hypothesis to explain their particular observations, without referring to established and comprehensive theories of light. At any rate, all this shows that Herder, like many physicists of his age, was uneasily aware that light theory was in an unsatisfactory state, and wished to bring the two rival theories, each of which had proved valuable in explaining certain phenomena, into some positive relation with one another.

But, along with the relatively "scientific" theories in the „Adrastea", there are echoes of the more mystical ideas on light which Herder had already recorded in his „Ideen". For example, light is called the „unversiegbare Quelle Alles Lebens".[278] This phrase recalls the earlier mystical theories, but probably rests ultimately upon the age-old observation that the increasing light of spring brings new life to the earth each year. Herder again refers to the mysterious "inner" light, calling it „das Edelste, was in uns denkt, unser Licht",[279] and again „das Licht in dir, dein Gedanke".[280] The belief that light can act as a purifying agent in creation, as an awakener of life, also recurs:[281]

> Licht ist der stille Wirker der überall gegenwärtigen Gottheit, der immer erneuet. --- Der flüssige Aether wird einst auch dem Monde Leben geben und Gedeihen und Wachsthum.

He introduces a quotation from the Orphic poems at this point, showing us the mystical source of his inspiration. His poem „Orion", dedicated to his old friend, the astronomer von Hahn, is of the same quality:[282)]

Was regt und treibt und beseelet,
Wodurch sich Alles bewegt,
Und lebt und fühlt und genießet,
Und denket und strebet, ist - Licht!

Perhaps we can explain why light, more than any of his various „Kräfte", appealed to Herder so much. „Kräfte" could, on the one hand, be treated as natural, and even at times material agencies, as when light, electricity, heat, ether, etc. are referred to as „Materie", „Stoff", „Theilchen", and so on; on the other hand, they enabled Herder to introduce metaphysical, or even mystical ideas, at will. But they all had the great disadvantage of being invisible, intangible, elusive, and amorphous - with one exception. For light, which Herder regarded as a „Kraft",[283)] combined all the advantages of the „Kräfte", yet was also in the unique position of being visible. Like all true symbols, it is „anschaulich". It includes undifferentiated white and all the colours, thus comprehending both general and particular kinds of content; as rays, or as waves, it can also be described in terms of form. And finally, there clings around it an abundance of traditions and associations, reaching back to the earliest religions, in which it repeatedly figured as the perennial symbol of eternal life and perfect goodness.

The short sketch „Kalligenia", written in Herder's last years, and already briefly referred to, contains a singular description of a mystical dream or vision. (It has been quite undeservedly ignored by critics, even by those who discuss Herder's mysticism.) Faced with a cosmic view of change and transformation, the initiate calls out:[284)]

„Laß mich ein Symbol sehen dieses sanften Strebens, dieses unendlichen Werdens, du unsichtbare Kraft!" rief ich in innigster Bewegung -

Und siehe da! Licht glänzte vor mir, ein Stral des reinsten Lichts. Da er sich theilte, wars, als sähe ich in ihm alle Gestalten der Dinge in der ganzen Eintracht ihrer Verhältniße und Formen. Punct, Linie, Kreis, Säule, Würfel, jede Schwebung und Schwingung der Natur, Blumenketten in allerlei Farben, jede auf dem kürzesten Wege zu ihrem Ziel eilend, dann sich hebend zur sanftesten Flamme aufstrebend zu Einem Punct harmonischen Lebens.

The One and the Many, form and content, permanence and change - all the disparates which Herder's complex nature unceasingly sought to combine - find reconciliation in this apotheosis of light, this remarkable product of pure mysticism.

d) Optics and the theory of colour.

In his early writings on aesthetics, Herder rightly contended that the empirical psychology of the senses had hitherto been too much neglected, and that theorists had been excessively preoccupied with a priori definitions of beauty and other traditional aesthetic concepts. When we now proceed to examine his views on visual perception, and their relation to the theory of optics, we shall find that he himself approached the subject from the psychological angle. We shall therefore be compelled to devote as much attention to the psychology of visual perception as to physical theories of optics.

We noticed in our discussion of mathematics that Herder, in his fourth „Kritisches Wäldchen" of 1769, proposed that the science of optics should be made the basis of a new system of aesthetics of vision. The corollaries to this statement were that the psychology and physiology of hearing should pave

the way for a new system of musical aesthetics, and that the psychology and physiology of the sense of touch should transform the aesthetics of plastic art.

Accordingly, the first problem which Herder encountered in optics was that of distinguishing between visual and tactile sensations; this can be reduced to the more particular problem of explaining which senses we use to judge distance (and magnitude and shape). The solution to this celebrated problem is reached, of course, when we recognise that what is now called "blending", or "complication", or "fusion" takes place;[285] this means that we first learn to judge distances etc. by touch, and these tactile sensations, through habit, gradually become "blended" with our sensations of seeing, so that we eventually appear to "see" distances, and we correlate visual shapes and apparent magnitudes with our earlier experiences of touch.

It is generally believed that Herder reached this solution in his fourth „Kritisches Wäldchen" of 1769.[286] Actually, the unpublished manuscript „Anfangsgründe der Sternkunde" of 1765 shows that he knew that our judgements of distance are acquired by habit, not directly by vision, at least four years earlier. His words are as follows:[287]

> Alle Sterne scheinen gleich entfernt zu seyn und auf einer Fläche zu stehen: dieses kommt daher, weil aller ihrer Bilder [sic] sich im Auge auf einer Fläche mahlen und wir von der Entfernung der Dinge nicht unmittelbar aus den Sinnen sondern durch Gewohnheit urtheilen.

However, he does not yet specify the rôle of touch in this passage.

In the fourth „Kritisches Wäldchen", he mentions Diderot, whose "Lettre sur les aveugles", as Clark[288] points out, recorded the observations of the

surgeon Cheselden upon ~~the blind~~ a boy ~~Saunderson; this boy's~~ whose sight had been restored by a historic operation of "couching" for cataract in the early eighteenth century. Herder mentions Cheselden by name in the same work.[289] In his 1770 essay on language,[290] he also refers to Robert Smith's "Compleat System of Opticks", which, as Clark notices, also mentioned Cheselden's conclusions. This surgeon's report, in fact, showed an understanding of "blending", and it is to be supposed that Herder acquired his knowledge of it from this source.

On the other hand, Suphan also names Diderot's "Lettre sur les sourds et les muets" as one of Herder's sources, as well as Berkeley's "New Theory of Vision" (1709).[291] But while there is proof that he used this work of Diderot, he does not name Berkeley's work until after he had put forward his own theory concerning "blending". However, Cheselden's report does not dwell on the cardinal importance of touch in our judgements of distance so exclusively as Herder does. For Cheselden, as quoted by Robert Smith, also says that "the apparent magnitude of the object in view"[292] is of great importance as a guide to distance, and adds that "the ideas of distance are suggested to the mind by the ideas of magnitudes of objects."[293] But Berkeley is much more concerned with tactile sensations, and he stresses the need for exact distinctions between sight and touch, just as Herder does;[294] like Herder, he treats the problem theoretically and deductively (but not mathematically) as well as inductively, whereas Cheselden had dealt only with its empirical, inductive aspects.

It is therefore possible that Herder had read Berkeley's work earlier than it appears from his later references to it. This becomes more probable when we read sentences such as the following in Berkeley's work:[295]

> --- those lines and angles have no real existence in nature, being only a hypothesis framed by mathematicians, and by them

> introduced into optics, that they might treat of that science in a geometrical way.

He thus considers that mathematical optics can tell us nothing about the subjective aspects of vision, in the same way as Herder, in 1769, says of our sense of hearing: „abstrahirend von Verhältnißen, weiß der Mathematiker also von dem, was Ton ist, so wenig als der Naturlehrer."[296] Herder, like Berkeley, tended to dwell upon the subjective aspects of perception more than upon its objective conditions, so that exact physical optics plays little part in his theories. Altogether, the influence of Berkeley upon Herder has been much underrated, perhaps because Berkeley's name is associated with the subjectivism which Herder later criticised so virulently in the Kantians. Nonetheless, there survives, unpublished, an entire notebook, devoted by Herder to excerpts from Berkeley.[297]

Herder's real claim to originality in his treatment of this whole topic is, of course, that he applied the study of tactile sensations to aesthetics, to plastic art. The influence upon him of the various writers named above in no way detracts from this independent achievement.

Let us now examine Herder's more general views concerning visual perception and optics. In 1770, in an early version of his „Plastik", he again emphasises the subjective side of perception, and even says that visual perception is relative to the individual organism or human being with its own peculiarities:[298]

> So wie jedes Thier nach einer andern Gestaltung seines Auges auch eine andre Welt sieht: so werden auch im Menschlichen Sinne diese mancherlei innere Vorstellungen fühlbar.

Again and again he insists that the structure of the eye conditions our perception, and writes in 1799: „--- eine Logik des Sehens ist dem Verstande

durch die Form seines Werkzeuges selbst gegeben."[299)]

But the objective counterpart of these ocular studies, the theory of light, must not be neglected either; he says in 1787:[300)]

> Für die Philosophie der Empfindung ist eine Theorie des Lichts und des Bildes von gleich mannichfaltigem Nutzen.

The eye and the light, the image the eye perceives, are complementary in Herder's opinion, as the following famous words from the psychology essay of 1778 show:[301)]

> Wäre in diesem Körper kein Licht, kein Schall: so hätten wir auf aller weiten Welt von nichts, was Schall und Licht ist, Empfindung ---

As Koch realises, this sentence introduces the old mystical doctrine of an inner and outer light, which was later adopted by Goethe, who wrote:[302)]

> --- so bildet sich das Auge am Lichte fürs Licht, damit das innere Licht dem äußeren entgegentrete.

(From our study of Herder's theories of light, we can guess at the nature of the mystical "inner light" he speaks of.) But while Goethe's words suggest that some natural process of adaptation takes place as the organism develops, it is clear from a passage in the „Ideen" that Herder envisaged a more teleological preadaptation of eye and light. The eye finds „sogleich den goldnen Lichtstral vor sich, der für dasselbe, wie das Auge für den Lichtstral, erschaffen ist und die Weisheit seiner Anlage vollendet."[303)]

As we noticed in considering the problem of perception, Herder also put forward a more particular and highly subjectivistic theory of vision. It is the theory of „Bilder". The subjective image („Bild") we create in the act of seeing, not its objective, external origin, is the most important

factor in perception:[304]

> Wir sehen nicht, sondern wir erschaffen uns Bilder.

However, this „Bild", as Schütze observes, is "the work of the creative artist, which is our 'soul' or integral individual self."[305] It must not be confused with the optical image produced within the eye itself. Nonetheless, it is probable that this concrete, optical image gave Herder his later idea of a spontaneously created inward „Bild", for, in the „Journal", he suggests that the act of vision produces an actual „Gemälde" within the eye and within the brain; the inward, cerebral image might even be traced by dissection, he conjectures with Maupertuis.[306] In the 1770 version of his „Plastik" (the version read by Goethe in Straßburg), he again says:[307]

> --- da ist auf der Netzhaut ein kleines Gemälde. --- Die grosse, allweite Gegend, die ich vor mir sehe, was ist sie ---? Bild!

Such ideas were perhaps suggested to him by Euler, who declared in a work published in 1768-1772 and read by Herder (although Herder first quotes it in 1800[308] - yet he may have read it, or a similar work, at an earlier date):[309]

> As often as we see an object, the image of it is painted on the bottom of our eyes; and this is produced by the rays which proceed from the object to us.

(The work is quoted in translation, the original edition in French not being available.) Euler even suggests that this image can be found in visible form, at the bottom of a dissected eye.[310]

Thus, in his earlier works, before he wrote the essay „Über Bild, Dichtung und Fabel" in 1787, Herder still uses the word „Bild" in a purely

optical, not a psychological sense. It was the concrete, physical usage of the word which Goethe adopted. He says that, in the study of light, „nicht von einem unbegränzten, bedingenden, sondern von einem begränzten bedingten Licht, von einem Lichtbilde, ja von Bildern überhaupt, hellen oder dunkeln, die Rede sei."[311)]

It is interesting that while Herder, especially in his early years, preferred the senses of hearing and touch, and rebuked the young Goethe (the „Specht"[312)]) because of his natural preference for vision, the "superficial" sense, he became more interested in vision as time went on, even devoting an essay to colour and vision in his last years, as we shall see. He had read various works on optics, as, for example, his history of the telescope in the „Adrastea" shows, and consulted Priestley's classical history of the subject.[313)] His increased interest in this topic must be explained partly by his general preoccupation with physical science in his last years, but also, in large measure, by Goethe's influence.

— — — —

Next, we shall review Herder's ideas on colour and on the composition of light. In a letter to Hamann in 1773, he says of the younger Hemsterhuis:[314)]

> Er ist, dünkt mich, mehr als Diderot der Philosoph, soll eben so stark in der Mathematik seyn und unter andren ganz Anti= Newtonische Offenbar[ungen] in der Optik unter der Hand haben, die diese ganze Wissenschaft verändern (was mir Futter für die Seele wäre).

The final parenthesis seems to anticipate, in a striking way, not only Herder's own later criticisms of Newton's theories of gravity and of light, but also the controversial attitude which Goethe adopted in his „Farbenlehre".

However, no anti-Newtonian theories on optics or colour appear in Hemsterhuis' published works, and Herder himself did not put forward any detailed views on colour until Goethe commenced his optical studies in the 1790's.

It is probable that Herder, perhaps influenced by Berkeley, had, by the time he wrote to Hamann in 1773, extended his belief that objective mathematical analysis is inadequate for explaining musical euphony so as to doubt, in turn, whether it can explain our perception of colour either. His only mention of colour during this period, in the „Plastik" of 1769, confirms this suspicion; for it is what Goethe called the „sinnlich=sittliche Wirkung" of colour, not the objective constitution of light, which Herder discusses here:[315)]

> Es ist zu beweisen, daß die grüne Farbe die fühlbare Farbe sei, gleichsam der Ton unseres Auges, wo es mit den Fühlnerven zusammenhängt --- die grüne und blaue Mittelfarben [wirken] auf Gefühl, blaue des Erhabenen, grüne des Angenehmen, weißrothe des Schönen.

The word „Ton" shows how close the link was between Herder's ideas on colour and on sound.

It was in January 1790, that Goethe, examining Büttner's prisms, suddenly saw the way open for his own anti-Newtonian colour theory.[316)] And in the following year, he wrote to Karl August:[317)]

> Noch kann ich mit lebhafter Freude melden, daß ich seit gestern die Phänomene der Farben wie sie das Prisma, der Regenbogen, die Vergrößerungsgläser pp. zeigen auf das einfachste Principium reducirt habe. Vorzüglich bin ich durch einen Widerspruch Herders dazu animirt worden der diesen Funcken herausschlug.

Clearly, some important development had taken place. Since his first

intuitions had come to him, he had conducted many experiments, and we know that around this very time he succeeded in formulating his results and convictions in a unified pattern.[318] But, in the absence of more detailed information, we can only conclude that Herder, as his earlier words to Hamann also suggest, may have had more influence upon Goethe's colour theory than is generally supposed. Besides, Caroline mentions Goethe's early optical experiments in a letter to Gleim in 1791.[319] Herder, around the same time, attended a meeting of the „Freitagsgesellschaft" at which Goethe delivered a lecture on the prism,[320] and he refers himself to Goethe's optical pursuits in a letter to Heyne in the following year.[321] In 1928, a fragmentary letter from Herder to Goethe on the subject of colour was discovered and published.[322] This document probably dates from late in 1793, or from 1794. In it, Herder criticises Goethe's „Versuch, die Elemente der Farbenlehre zu entdecken", and observes that black and white, mixed together, produce grey, which is also produced by the mixing of all the colours. (We know that this applies only when pigments, which are never quite pure, are mixed, for the pure colours, when mixed, should produce white, as Newton realised.) Upon this observation, Herder bases the supposedly "Newtonian" objection to Goethe's theory that all the colours must therefore be actually present „in Licht, durch Schwarz modificirt", adding „Du wirst dem Zweifel leicht begegnen." Indeed, Herder's "objection" is closer to Goethe's, or even Aristotle's[323] point of view than to that of Newton, who, of course, derived the colours from white light alone, without referring to "darkness" at all. However, all this further confirms our contention that more exchanges took place between Herder and Goethe on the subject of colour and optics than is commonly supposed.

Herder began to enunciate his own more or less "anti-Newtonian" views

on colour in his „Kalligone" of 1800, when he wrote the following words, in dialogue form:[324]

> Sie glauben also --- nicht an Newtons sieben einfache Farben? --- Tobias Mayer hat aus Mischungen der drei Hauptfarben 819 Farben deduciret.

The belief which led Herder to assert that light is transmitted „in sanften Strömen" rather than in (presumably abrupt and "mechanical") waves, a belief in gradual transitions, originally inspired by the Leibnizian principle of continuity, is again at work here.

Like Goethe, Herder also declares that darkness, as well as light, is essential for producing colour. He says of black:[325]

> Es [i.e. das Schwarze] scheinet mir, wenn das Licht der glänzende Vater des ganzen Farbensystems ist, die Mutter der Farben. Als Licht die Finsternis bestrahlte, ging jenes tiefe Blau aus ihm hervor ---

Suphan, in a note to the text,[326] rightly notices Goethe's influence here.

Herder wrote an essay on colour for the „Adrastea"; it remained unpublished, however, during his own lifetime. This essay is parallel to, and arises out of his earlier disquisition upon light, since it likewise sets out to reconcile the rival theories of Newton and Euler, this time with reference to colour.

He begins, in a way which recalls his attitude to musical euphony in 1769, by affirming that the objective study of light is not in itself enough to explain the origin of colour; the eye and its workings must also be investigated. For, like Euler,[327] Herder says that the ultimate cause of colour production is unknown; it may just as well be determined by the nature of the eye as by the nature of light.[328] In insisting that the

ultimate physical cause of colour production remains unknown, Herder also involuntarily reminds us of Goethe's belief in an irreducible „Urphänomen" of colour.[329)]

He again rejects Newton's seven colours, saying that the transitions between them must be gradual, and declares:[330)]

--- wie Schwingungen des Lichts zeigen sich die Farben.

This recalls Goethe's description of colours as „Taten des Lichts", as well as Herder's own dislike for abrupt and mechanistic transitions as implied by Newton's „Brechung" (refraction) of light.

His next words on the colours take us by surprise:[331)]

Polartiges ist in ihnen nichts.

This remark is obviously directed against Goethe, who was now thoroughly estranged from Herder. Herder probably considered, despite his usual liking for "dialectical" formulations, that the diametrical polarity of light and darkness, like Newton's seven distinct colours, implied too harsh a distinction, and that it failed to do justice to the nuances of shading which appear between all colours. He calls yellow a „Maximum", again employing Lambert's phrase as he had done in the „Ideen". We may remember that Herder considered that a „Maximum" is produced by the interaction of <u>many</u> forces, not just by two poles. Thus, yellow arises amidst <u>many</u> colours, so that Goethe's "polarity" theory of colour must be rejected.

Herder here treats yellow as the central colour. (We may remember that, in the „Plastik" of 1769, he had called green and blue the „Mittelfarben".[332)]) It is also the „irdischer Repräsentant" of invisible, pure white light.[333)] But we know from the colour spectrum that yellow is the third colour from the lower extreme of the scale. He later adds the rather forced explanation that the lower "half" of the spectrum <u>seems</u> longer than

the other, although the true centre of the series, the "invisible" white, cannot be seen by the human eye.[334] He also speaks of yellow „das oben in der dichtesten Spitze zum Roth aufsteigt":[335] thus red, at the end of the spectrum, now becomes the apex of the colour series, just as in Goethe's colour pyramid.

Herder's criticisms of Newton's theory are much less virulent than Goethe's. It is Newton's "mechanistic" treatment of light („die zarte Materie", as Herder calls it[336]) which he resents, not his supposition that it is material (i.e. corpuscular), or even his description of it in terms of mathematics; for Herder is never hostile towards mathematics per se, but only when it is allied to mechanics:[337]

> --- so ist mit Stoß und Hieb, mit Auf= und Abprallen hier nicht Alles ausgerichtet.

For Herder's emotional attitude towards light led him to believe that it must flow gently, and that the colours must intermingle smoothly; Newton's mechanics offended his poetic sensitivity.

In the „Kalligone", he says of the eye:[338]

> --- so entstand in ihm die Scala der Farben natürlich.

This is parallel to a statement in Goethe's „Farbenlehre":[339]

> Das Auge verlangt dabei ganz eigentlich Totalität und schließt in sich selbst den Farbenkreis ab.

Herder says, however, in the essay on colour, two years later than the „Kalligone":[340]

> Der Chemie muß es überlassen bleiben, in die Bestandtheile der Farben und des Lichts einzudringen ---

He now implies that colour has some objective, intrinsic reality, independently of the human eye. Thus, as usual, he employs both subjectivistic and objectivistic theories at different times. But, after his words on chemistry (which, incidentally, remind us of Goethe's investigations into „chemische Farben"), he reaffirms the subjectivistic theory:[341]

> --- ist überhaupt nicht alles, was wir sehen, ein unsichtbares Bild der Seele?

(The word „Bild" is used psychologically here, not optically. This is true of all its applications after the 1787 essay „Über Bild, Dichtung und Fabel".) Thus, in the last resort, he prefers subjectivistic, or ocular theories of vision and colour perception to those based purely upon the physics of light.

Finally, Herder attempts to reconcile the colour theories of Newton and Euler, as he had done with their theories of light. He declares:[342]

> --- warum sollte man die zarte Flüßigkeit der Lichtmaterie sich nicht eben sowohl in Schwingungen bewegen lassen, als in schießenden Pfeilen?

On this occasion, he retains the corpuscular theory associated with Newton, but rejects his mechanics, substituting for them the wave theory of Euler. The colours are not broken-off parts of the light, but modifications of it. As before, he seems to imply that light waves are of a gentle, not an abrupt kind, for he subsequently uses the word „Strömung" instead of „Schwingung". As in his essay on light, he still seems uncertain about precisely how light is transmitted.

Once again, he adds a physiological definition to these external ones:[343]

> Das Licht reizt; Theile des Nervs schwingen sich; die Empfindung erfolgt - wir können kaum weiter.

This recalls his early attempts to apply the neurological theories of Haller, Burke and others to the psychology of perception.

He further makes use of Euler's analogy between the colour spectrum and the musical scale; we shall examine this question in the following section.

Goethe links the colour red with heat or fire, but only symbolically. Herder, however, makes this comparison a literal one:[344)]

> Offenbar brennet der zusammengespitzte rothe Stral heftiger, als der blaue ---; wir kennen kein Licht, ohne mit Feuer= stof [sic] verbunden.

Herder was right, although he did not know of infra-red rays as such. We shall return to this question in our later section on theories of heat.

However, all this is again vague and unscientific. As Haym says:[345)]

> Er nannte Theorie, was nur eine Summe poetischer Aperçus war.

But although Haym's criticism is true, there is, nevertheless, a certain system behind Herder's so-called "theory" of colour. The logic of this is not that of mathematics, nor of empirical observation, but of certain fixed associations within Herder's peculiar intellect. The desire for synthesis, the counterbalancing remarks on subject and object, and rejection of "mechanistic" theories, the appeals to psychology and physiology, the belief in gradual transitions - all these are familiar and interconnected features of Herder's mind, and they cannot be treated either as piecemeal fancies, or ascribed entirely to Goethe's influence. The whole disquisition upon colour is inferior to Herder's early writings on hearing and touch, because, as Haym observes,[346)] his senses were musically rather than visually attuned, and because he lacked Goethe's powers of graphic and painstaking observation. He did not study the theory and practical workings of colour nearly carefully

enough, but simply fell back upon a priori criticism of existing theories. He thus committed the very error he so stridently condemned in Kantian philosophy.

d) Sound, and the analogy between colour and pitch.

We have already discussed Herder's early views on acoustics and hearing in our section on mathematics. To this we now add that Herder, in condemning those who analyse musical euphony purely in terms of harmonic intervals, is supported to some extent by the physicist Euler, who wrote in 1768:[347]

> But the sentiment of pleasure excited by fine music, must not be confounded with the knowledge [i.e. of harmonic and rhythmic intervals] of which I have been speaking --- something more is wanting, which no-one hitherto has unfolded.

While there is no evidence that Herder read this work before the 1790's, we cannot help feeling that his classing of Euler, in 1769,[348] among the mere analysers of harmonic intervals, is not entirely justified.

Herder was not interested in the theory of sound except in relation to musical acoustics. He mentions d'Alembert, Diderot, Euler, Gravesande, Mersenne, Sauveur,[349] and Chladni[350] as writers on the subject. But no further mention of the aesthetics of music is required in our study, since we have already examined this topic from the scientific angle, which alone calls for our attention. We have found that Herder thought that physics was not enough, but that psychology and physiology must be invoked to explain our pleasurable sensations at musical sounds.

Characteristically, Herder was fond of the analogy between the musical scale and the colour spectrum. Even Aristotle had noticed the correspondence between pitch and colour, and between musical harmony and pleasing

colour combinations.[351] But it was Euler who, in Herder's age, gave new life to this old theory, by employing the analogy of sound waves in his undulatory theory of light, which explained the colours as produced by varying frequencies of light-waves.[352] He declared:[353]

> The parallel between sound and light is so perfect, that it fits even in the minutest circumstances.

Thus, the musical octave and the colour spectrum correspond exactly.

Already in 1769, Herder calls the ocular nerves „Saitenspiele für die Farben".[354] We have earlier seen how, in the same year, he describes the colour green as „gleichsam der Ton unseres Auges".[355] Thus, he appears to have related colour and sound from an early date, probably under Euler's influence. Chladni, whose work Herder mentions in his „Kalligone",[356] in 1800, and who himself visited Herder in 1803,[357] had devised a means of making sound patterns visible by spreading sand over vibrating plates - the famous "Chladni's figures". Chladni may thus also have encouraged the older Herder to use the analogy of eye and ear. An extreme case of interrelations between colour and sound was that of the celebrated „Farbenklavier", an experiment in synaesthesia. Herder did not approve of it, however, declaring in 1778, in the „Plastik", that colours, appealing solely to the eye, can provide only „das flachste Gedankenloseste Vergnügen."[358]

Already in the „Kalligone", Herder draws several parallels between musical sound and colour, but it is in the later essay on colour that he presents his fullest exposition of the analogy. Some of the parallels are contrived, as, for example, the idea that both the musical scale and the colour spectrum have no perceptible central unit;[359] but most of them do not contradict the scientific knowledge of the times. Herder now

acknowledges at last that Euler is his authority and source for the whole analogy, although Newton too had compared the scale and the spectrum as both consisting of seven units[360] (disregarding the eighth note of the octave).

Goethe, however, does not fully accept this scientific theory of Herder's. His views on this analogy are much more circumspect (as well as more metaphysical and obscure) than Herder's or Euler's:[361]

> Vergleichen lassen sich Farbe und Ton unter einander auf keine Weise; aber beide lassen sich auf eine höhere Formel bringen, aus einer höhern Formel beide, jedoch jedes für sich, ableiten. --- Beide sind allgemeine elementare Wirkungen, nach dem allgemeinen Gesetz des Trennens und Zusammenstrebens, des Auf= und Abschwankens, des Hin= und Widerwägens wirkend ---

For Goethe, the analogy is only indirect, through a higher common factor from which both may be derived.

Knebel hailed Herder's use of the analogy with the words:[362]

> Welch schönes Concert zwischen Himmel und Erde! So entsteht die Musik der Sphäre!

These words express Herder's feelings as well as Knebel's. Haym realises that it was the aesthetic quality of the analogy which appealed to Herder,[363] and says on another occasion that it provided him with evidence for his belief in universal harmony.[364] Such motives are scarcely those of the strict physical scientist.

e) Heat.

Scientific theories of heat in Herder's age were in an uncertain state. Heat was at times considered to be a material substance,[365] which was identified by Nollet and others with electricity,[366] and was widely believed to be imponderable.[367] In the seventeenth century many had supported the true

theory that heat is a kind of motion,[368] but this remained for long a disputed hypothesis. Lavoisier thought that it was a measurable fluid, calling it "calorique",[369] but Benjamin Thompson revived and proved the true theory in 1798,[370] though his achievement was not universally accepted for a considerable time.

Newton, however, had associated heat closely with light, declaring that light (which was seen as material or corpuscular), on striking material bodies, sets up vibrations within them; we perceive this effect as heat.[371]

Although Herder had linked heat with electricity, as we earlier remarked, he more often relates it to light, just as Newton had done. In the „Adrastea", he appears at first to support the Newtonian theory, saying that light flows „in sanften Strömen" through space „bis es in Nähe unsrer Erde sich mit Feuerkräften waffnet."[372] Bode, in a work known to Herder, had likewise spoken of light, „dessen feuerlose Stralen sich durch den Aether fortpflanzen, aber erst --- an der Erdoberfläche mehr oder weniger Wärme hervorbringen und bewirken."[373]

In his essay on colour, Herder is more specific:[374]

> Wir kennen den Sonnenstral nur, wie er zu uns kommt, mit Wärme=stoff gerüstet; seine sanfteren Schwingungen und Directionen in der dephlogisierten Luft kennen wir kaum, im Aether noch minder.

Like Newton, he associates heat with light, but also introduces the current eighteenth century doctrine that heat is a substance. Thus, light becomes associated with the heat-substance upon the earth's surface. The whole conception is further complicated when Herder introduces Stahl's[375] theory of "phlogiston", a hypothetical substance thought to be liberated during combustion, and therefore also associated with heat. In the passage quoted above, Herder seems to imply that the heat-substance („Wärmestoff") and

phlogiston are identical (since the action of light is „sanfter" in air which contains no phlogiston). We shall return to the phlogiston theory in our section on chemistry.

But in 1800, Herschel discovered "that rays of ordinary light transmit a certain amount of heat, that this effect is more marked for light at the red end of the spectrum ---, and that beyond the red end there are rays which transmit heat but do not affect the human sense of vision."[376] Herder wrote in 1802 of „Herschels Entdeckung, daß die Sonne uns außer dem Licht auch unsichtbare Wärmestralen zusende'", quoting an article by von Hahn in Bode's „Astronomisches Jahrbuch".[377] This shows that Herder's scientific knowledge could be extremely up to date in an age of slower communications. But since neither Herder himself, nor von Hahn in the article Herder cites,[378] mentions either red or infra-red rays in particular, and both speak only of „unsichtbare Wärmestrahlen", we conclude that Herder, in associating the colour red with heat, as we earlier noticed, was simply placing a literal interpretation upon the traditional symbolism which used red, the colour of fire, to represent heat or warmth.

We conclude that Herder's views on heat reflect the materialistic theories current in his age, as well as the general uncertainty which prevailed throughout the subject at that time. They are probably influenced by Newton's theory, as well as by the phlogiston hypothesis. Herder acclaimed Herschel's discovery of radiant heat when he first met a short notice on it. He himself added nothing to existing scientific observations or theories on the subject.

4. Chemistry.

Herder writes in the „Ideen":[379]

> Die Chemie, die in den neuen Zeiten so eifrig geübt wird, öfnet [sic] dem Liebhaber hier im unterirdischen Reich der Natur eine mannichfaltige zweite Schöpfung; und vielleicht enthält diese nicht blos die Materie, sondern auch die Grund= gesetze und den Schlüssel zu alle dem, was über der Erde gebildet worden.

But although he here avows that chemistry is a highly significant science, he broadly neglects the subject throughout his works. Again, in 1798, he says of his hopes to attend classes on chemistry:[380)]

> --- ich wünsche sehr, daß es zu Stande komme, indem ich nach dieser Wissenschaft eigentlich durste.

It appears that he at least discussed the subject with the chemist Scherer, who visited him in the following year,[381)] but whatever new knowledge he acquired had no repercussions upon his own writings.

Let us, however, discuss what knowledge of chemistry Herder did possess. Firstly, the reader of Herder's works soon encounters the archaic notion of the "four elements" - earth, water, air and fire. In the unpublished dialogue on water, written in Königsberg, the chemistry of water is discussed only in terms of the "elements". It is curious that Herder even uses the old symbols for them - e.g. $\triangledown$ for water, $\triangle$ for air, and so on.[382)] In a notebook of around 1766, quoted by Suphan, Herder enumerates the supposed agents of universal change as follows:[383)]

> Elemente, Feuer [„Erde" scored out], Meer, Luft, Aether.

These terms reappear throughout the first two parts of the „Ideen". They constitute, for Herder, the crudest forms of matter, within which the subtler „Kräfte" work. But fire, particularly in the form of "elemental fire", has something of the status of a creative „Kraft", as we noticed in our discussion of light. The other "elements" are simply media, as the presence of „Aether"

in the above list indicates.

On one occasion in the „Ideen", these archaic concepts are used to lend support to the Mosaic narrative of creation:[384]

> Im Tode wird unser künstliches Gebäu in Erde, Wasser und Luft aufgelöset, die in ihm organisch gebunden sind.

This is one of the rarer occasions in this work where orthodox theology directly influences Herder's scientific views. The passage also recalls the old doctrine of the microcosm, which was thought to be compounded of the elements found in the macrocosm.

Usually, Herder contends that the "elements" (apart from earth) were creative agents in the earlier phases of our planet's existence:[385]

> Drei mächtige Wesen wirkten in diesen großen Zeiträumen, Wasser, Luft, Feuer.

Water and fire raged within the primitive atmosphere, and, through precipitation, gradually purified the air and shaped the earth's surface.

The scientific standing of the "elements" in Herder's day was already extremely low. Boyle had condemned these Aristotelian concepts in 1661. Nonetheless, they kept reappearing in the works of several reputable scientists for some time, but usually only in looser descriptions where the strictest chemical accuracy was not deemed imperative. Linnæus, in a work referred to and read by Herder,[386] even defined climate in terms of these categories:[387]

Unter dem Worte Clima werden hier alle vier Elemente verstanden.

The chemist Candido Pistoi, in a work from which Herder had made excerpts, clung to the old conception, and, like Herder, regarded fire as the most active of the four:[388]

--- so ist es doch so zu sagen die Seele von den andern.

Goethe named the "elements" as the effective agents behind environmental determinism as late as in 1824, in an essay dealing with the anatomy of rodents.[389] This recalls Linnæus' similar belief.

However, quantitative chemistry had begun to appear by 1740, with the work of Joseph Black in particular, and Herder's use of these archaic, qualitative notions can only be described as outdated. Similarly, when he mentions "elective affinities" (which we discussed in our section on dialectics), Herder says:[390]

Der Chymiker veranstaltet nichts als Hochzeiten und Trennungen.

Metaphorical though the words may be, they were favourites of the medieval alchemists.

In Herder's lifetime modern chemistry finally emerged with the work of Priestley and Lavoisier. The last great battle with the older school was fought over the traditional "phlogiston" theory of combustion, which had originally been propounded in the 1670's by Becher (then Stahl). The property of combustibility was substantivised as the hypothetical, imponderable substance "phlogiston", and a complex chemical nomenclature was evolved in accordance with it. Thus, modern oxygen was called "dephlogisticated air", nitrogen was "phlogisticated air", and hydrogen, although usually called "inflammable air", was sometimes identified with the elusive phlogiston itself.[391]

Herder never seems to have questioned the merits of the phlogiston theory, although Lavoisier had more or less disproved it by 1784.[392] Accordingly, Herder, in a rejected manuscript for part of the „Ideen", uses „Phlogiston" and „das Brennbare in der Luft" (presumably the "inflammable

air", hydrogen) as synonyms, as the older school of chemists did.[393] He takes note of Ingenhouß's important and recent discovery that plants extract an unbreathable gas from the air, and uses the phlogistic terminology to describe the process, just as Ingenhouß himself had originally done. The gas which the plants extract, he calls „das Brennbare", which is now therefore used to denote carbon dioxide.[394] (We have seen that „das Brennbare" is elsewhere equated to phlogiston, which usually meant hydrogen when applied to gases.) He also refers to the observation made by the climatologist Wilson, and widely accredited in Herder's day, that the presence of phlogiston in the air promotes organic putrefaction and hinders respiration, and that the Arctic air, because it is deficient in phlogiston (i.e. because it is colder), is purer than air elsewhere.[395] (Kant used the same theory to explain why Europeans find Africa unhealthy; the negroes, he said, are adapted to resist the noxious effects of phlogiston.[396]) We have also seen that Herder described how heat is produced by saying that light associates itself, on striking the earth, with atmospheric phlogiston; on this occasion, like many writers of the time, Herder in turn identifies phlogiston with „Wärmestoff", the hypothetical heat-substance.[397] It is possible that he first studied the phlogiston theory in Priestley's "Observations upon several different kinds of air", a work which he requested from Heyne in 1774 for the Count of Schaumburg=Lippe.[398] Besides, the chemist Pistoi, in the work Herder had read, fully accepted the theory.[399]

However, the phlogiston theory was already passing out of currency in the 1780's. The shrewd Knebel, in a letter to Herder in 1789, observes that the idea creates confusion[400] (in a work on electricity he has just read). But Herder cannot be blamed entirely for his confused ideas on the subject. Like many educated men of the time, he was compelled to use a

theory which was quite inadequate, for no alternative theory was as yet known to him. He simply used the phlogiston theory as best he could.

Herder's knowledge of chemistry was, in the long run, somewhat greater than the reader of his works would at first suspect. Among the notes he copied from Einsiedel's manuscripts were several passages on chemistry, unfortunately omitted in Dobbek's recent edition of Einsiedel's previously unpublished „Ideen".[401] (Einsiedel was a keen student of chemistry and mineralogy.) Herder possessed or read works on chemistry by Oetinger,[402] Mann,[403] Scherer and Fourcroix,[404] Jordan,[405] and others. Lavoisier, however, is mentioned only once, in 1801, in passing:[406] it seems that Herder failed to recognise his outstanding importance. Herder's late interest in chemistry, which was no doubt part of that general reawakening of his interest in all branches of physical science in his last years, yielded no productive result in his works. He did suggest, however, as we earlier saw, that chemistry might provide new information about the objective origins of colour,[407] but it was Goethe, not Herder, who proceeded to investigate the chemistry of colours. Such ideas on chemistry as do appear in the „Ideen", even apart from mentions of the "elements" and phlogiston, are usually vague and uninformative, as when Herder says that „Kalke und Salze, so wie Kieselerde und Luftsäure" are necessary agents in the natural evolution of „Halbmetalle".[408] His interest in chemistry awoke too late for him to remedy these earlier deficiencies. But the real reason why he could never have appreciated exact, quantitative chemistry is that his views on matter and its structure were far too indeterminate, as we discovered at the beginning of this chapter; he never finally succeeded in distinguishing between material substances and the qualitative „Kräfte" which bedevilled his entire scientific thought.

5. The geological sciences and cosmogony.

a) Mineralogy.

Although Goethe, Knebel, Einsiedel, Merck, Schröter[409] and August Herder were all persons with whom Herder was in close contact at various times, and all possessed a considerable knowledge of practical mineralogy, Herder himself never evinced any real interest in empirical observations of the minerals and rocks of which the earth is composed. Largely through discussions with his son August, and probably with Einsiedel, he does seem to have acquired some knowledge of mineralogical and mining terms,[410] but this did not lead him to write anything on the subject himself.

We thus commence our study of Herder's geological ideas with the realisation that he lacked that training in concrete observation without which the theorist in geology must rely largely upon speculation.

b) Palaeontology.

We shall discuss Herder's knowledge of palaeontology in our section on the evolution of life.

c) Chronology: the age of the earth.

Herder says in an earlier version of his „Älteste Urkunde", around 1771 or 1772:[411]

Aber so wißen wir ja nicht das Alter der Welt!

The Book of Genesis, he says, can give us no information on this subject. But in 1774, in the final version of his „Urkunde", he says that „die Welt fast sechstausend Jahr alt --- ist."[412] In a sermon of the same year, he says of the three Magi:[413]

--- viertausend oder Eins oder Zwei wars, da die Weisen ankamen.

Thus, it appears that during his religious phase, he came to accept the Biblical chronology he had rejected two or three years previously.

In the „Ideen", he rejects Buffon's longer chronology as arbitrary (which it is), and dismisses the "aeons" of various ancient mythologies for the same reason.[414] But he does not accept the "days" of creation literally either, and concludes:

> Der Fels unsrer Erde ist sehr alt und die Bekleidung desselben hat lange Revolutionen erfodert, über die kein Streit statt findet. Hier läßt Moses einem jeden Freiheit, Epochen zu dichten, wie er will.

Moses' "days" are only an abbreviated and figurative description, Herder claims; he thereby anticipates a favourite compromise of nineteenth century chronologists. Again in an essay of 1792 he says that Moses' "days" tell the geologist nothing.[415]

Kant's exceptional chronology, in his „Allgemeine Naturgeschichte", involving „vielleicht eine Reihe von Millionen Jahren und Jahrhunderten",[416] may have been responsible for Herder's caution. Another of Kant's remarks, in the lectures on physical geography attended by Herder, may have led him to suppose that Moses' "days" are symbolic:[417]

> Bei Gott ist eine Zeit wie der Tag zum Schaffen zu viel und zur Ausbildung der Erde zu wenig.

Alternatively, Whiston, whom Herder mentions on several occasions,[418] had declared that Moses' "days" were really years;[419] this may also have influenced Herder's ideas.

However, it is clear that his mature views on chronology were fairly liberal for his time. Bruntsch[420] lists several of his contemporaries,

most of whom doubted Archbishop Ussher's scriptural chronology, but often named arbitrary figures which are still vastly too short by modern reckoning. Herder was wise to leave the question open, since no detailed evidence became available until well on in the following century. On the other hand, his remark that the „Revolutionen" of the primeval earth must have lasted for „Jahrtausende"[421] indicates that he too greatly underestimated the earth's age. Besides, as we shall soon see, he believed that some of these vast geological changes took place within the time covered by human records; this again implies that his own computation was only a fraction as large as present-day estimates of the geological time-scale.

d) The composition of the earth's core and the earliest mountains.

Suphan was the first to point out that Herder, like Goethe, believed in an „Urgebirge", and thought that this, as well as the earth's core, was composed of granite.[422] Suphan believes that Goethe gave Herder this idea, but that Herder was the first to put it on paper.

Mentions of an „Urgebürge", an „Erdrücken", or „der Kern unsrer Erde, der Granit" are so frequent in the „Ideen" that only a list of page-references can be given here.[423] One characteristic passage may show how close Herder's views are to those expressed by Goethe in his essay „Über den Granit":[424]

> Der alte Granit, der innere Kern unsres Planeten, zeigt soweit wir ihn kennen, keine Spur von untergegangenen organischen Wesen --- Wahrscheinlich ragte er in seinen höchsten Spitzen über die Wasser der Schöpfung empor, da sich auf denselben keine Spur einer Meerwirkung findet ---

Let us for the moment ignore the problem of how the granite core was first formed, and try to ascertain the sources behind Herder's and Goethe's

theory.

Maro (1740), Arduino (1759), Lehmann (1759 et seq.) and Delius (1770) all distinguished "primitive mountains" from later "secondary" ones.[425] Herder nowhere mentions these writers, however. Werner, in a geognostic table published in 1777 for limited circulation, speaks of „uranfängliche Gebirge", and mentions granite first in his list of the rocks which form these mountains.[426] De Saussure, in the first volume of his great work on the Alps (1779), says he has devoted most attention to the primitive mountains, particularly those composed of granite, since he believes they contain the secret of the origin of things.[427] But it was Pallas, in 1777, who first declared unequivocally that the primitive mountains and the earth's core were composed of granite.[428] Sauter,[429] followed by Rouché,[430] says that Buffon also believed that the earth's core consists of granite. Linneus postulated an „Urberg der Schöpfung", situated near the equator;[431] this may in turn have been influenced by the Book of Isaiah, which mentions a "mountain of God", situated, however, towards the North.[432] But Linneus does not say whether this mountain was made of granite or not.

Suphan is wrong in saying that Herder recorded the granite theory before Goethe, who, in fact, writes to Merck in 1782:[433]

> Wegen des Granits, ob ich gleich überzeugt bin, daß er die Basis unsrer bekannten Oberfläche ist, werden wir aber doch wohl nachgeben und einen granit secondaire statuiren müssen.

The French words, and a mention of the Abbé Soulavie in the same letter indicate that it was this writer who gave Goethe his idea. Goethe already seems to distinguish between a primitive mountain system (his later „Urgebirge") and a secondary one.

Herder may have acquired the idea from any of several sources. Goethe himself may have introduced it to him, or the ideas of Werner may have reached him in the early 1780's through students of the Freiberg geologist. He was also familiar with the mineralogical writings of Buffon, of course. In the „Ideen", he also refers to de Saussure and Soulavie,[434] and to Linnæus' „Urberg der Schöpfung"[435] (which may have suggested the word „Urgebürge"). Finally, he refers at least four times in the „Ideen" to the very work of Pallas which said that the primitive mountains, and the earth's core, were made of granite.[436] Grundmann concludes, probably correctly, that Herder took the granite theory from Pallas;[437] but we cannot rule out the possibility that some of the other writers named above may also have helped to shape his views.

However, Pallas says of granite:[438]

> --- rien n'est plus vraisemblable que de prendre cette roche pour le principal ingrédient de l'intérieur de notre globe.

He distinguishes between "montagnes primitives" and "montagnes secondaires", saying that the latter are built up from sediments deposited in the oceans.[439] This is very similar to the view of Herder, who distinguishes the „Urgebürge" from „herangeschwemmte Berge".[440]

We conclude that the granite theory was very much in the air in Herder's day, and that, by adopting it, Herder was indeed „auf der Höhe seiner Zeit", as Grundmann[441] maintains.

One other branch of the „Urgebirge" hypothesis has a more ancient pedigree. In 1775, Herder calls the great mountain systems „der Rücken der Erde".[442] In an early sketch for the „Ideen" he calls them the „Knochen der Erde".[443] Seneca had also likened the earth's rocks to its bones,[444] Leonardo too called the mountains the bones of the earth,[445] and Rouché

says that Leibniz refers to the "skeleton" of the earth.[446] Thus Herder combined the granite theory with another idea of much greater antiquity, and less scientific standing.

But the granite theory itself was rejected in the nineteenth century. Before his death in 1797, James Hutton discovered that granites are of igneous origin and differ greatly in age, some being of comparatively recent origin. (His discovery, however, was published only in 1899.)[447] Lyell too, in 1833, realised that granites vary in age.[448] At the present time, geologists are usually unwilling to commit themselves to any exact definition of the rocks which formed the earliest solid surface of the earth, for both sedimentary and igneous varieties are found amongst the oldest rocks known. The nature of the earth's interior is still little known, but seismological tests show that it is certainly not uniform, and consists of several distinct layers. It is interesting, however, that the contemporary earth-historian, G. Gamow, does not say that the earth's core is made of granite, but he does declare:

> The outer crust of the earth consists of a layer of granite --- extending to a depth of from 50 to 100 kilometers.

He notices that granite is absent only in the Pacific basin, from which it was removed, he believes, when the moon became detached from that side of the earth. Gamow thus seems to have returned to the old theory that the original crust of the earth was of granitic composition.[448a]

e) Cosmogony.

Herder's views on cosmogony are ambiguous and at times contradictory; they have to be pieced together from many scattered utterances, most of which, however, appear in the various versions of the „Ideen", Part I. Like

all such theories of that age, they are almost entirely speculative.

Descartes,[449] Leibniz[450] and Buffon[451] had declared that the earth first arose as a molten body, having become detached in some way from the sun. Herder writes, in a poem of 1769, referring to the various cosmic bodies:[452]

> Wann in unendlichen/Ruh ewigkeiten [sic] riß ihr Rad sich /
> feurigen Schwungs in den wüsten Äther?

He thus seems to have accepted the theory that they all passed through an initial glowing or molten state, at this time. But in the „Ideen", Part II, he shows that he has altered his opinion, saying of the granite „Urfels":[453]

> Daß dieser Fels glühend aus der Sonne geschleudert sei, ist ein riesenhafter Gedanke, der aber weder in der Analogie der Natur noch in der fortgehenden Entwicklung unsrer Erde Grund findet --- Viel wahrscheinlicher ist, daß dieser wunderbare Urfels durch innere Kräfte sich selbst gebildet d.i. aus dem schwangern Chaos, daraus unsre Erde werden sollte, verdichtend niedergesetzt habe.

(For he says that a molten state would have prevented any water from appearing on our planet.) However, in an earlier, rejected manuscript, he says:[454]

> Hat unsre Erde sich unläugbar aus einem flüßigen Zustande gebildet.

Despite their apparent contradiction, the last two passages can be reconciled. Kant, in his „Allgemeine Naturgeschichte", had stated that matter, in the form of small particles, was more or less evenly distributed throughout space before our universe emerged in its present condition;[455] he does not specify the size, shape, or composition of these particles, but

it is obvious from his subsequent descriptions of how the stellar and planetary bodies grew by accretion, under gravitational attraction, that they obeyed the laws of rotating fluid masses. For example, he says that the highest mountains on the earth ought to be at the equator.[456] (Herder, as we shall see, later uses the same argument.[457]) Thus, collections of fine particles behaved like rotating fluid spheres, without having been molten, or, in the case of the planets, „aus der Sonne geschleudert". All this tallies precisely with Herder's opinions.

An interesting passage, occurring in Part III of the „Ideen", has completely escaped the attention of critics, perhaps because it appears in a chapter written much later than the geological sections of the work:[458]

> Als einst im Unermeßlichen der Werkstoff künftiger Welten ausgebreitet schwamm, gefiel es dem Schöpfer dieser Welten, die Materie sich bilden zu lassen nach den ihnen anerschaffenen inneren Kräften. Zum Mittelpunkt des Ganzen, der Sonne, floß nieder [N.B. „floß" - the particles behave like a fluid] was nirgend eigne Bahn finden konnte --- Was einen andern Mittel= punkt der Anziehung fand, ballte sich gleichartig zu ihm ---

This, in essence, is a restatement of the cosmogony of Kant.

Unlike Kant, Herder goes on to describe in detail how the diffuse, rotating mass of the earth developed towards its present state. The components of the earth, as we noticed above, became „verdichtend niederge= setzt".[459] Herder further explains in the „Ideen":

> In periodischen Zeiträumen entwickelte sich aus geistigen und körperlichen staminibus die Luft, das Feuer, das Wasser, die Erde.

The order given here can scarcely be meant to be chronological, for, while

air may have arisen first, it seems from other passages that Herder believed a solid core had formed at an early stage, and that the other "elements" subsequently acted upon it. He says, for instance, in an earlier manuscript for the „Ideen", that the granite core „wahrscheinlich durch Feuer in seine [„jetzige" scored out] Masse überging."[460] This implies that fire appeared after earth, which it then consolidated into its present granitic form. Another passage confirms this order:[461]

> Die Luft, die diesen Klumpen umgab, war von Wasser und Feuer noch nicht gesondert: beschwängert mit den mancherlei Materien, die sich erst in vielfältigen Verbindungen und Perioden an die Grundlage der Erde setzten und ihr allgemach Form gaben --- (etc.)

The primitive atmosphere was charged with water, fire, diverse kinds of matter, and the various „Kräfte" we earlier noticed. (Compare the above phrase „aus geistigen und körperlichen staminibus".) Thus, from a small nucleus,[462] arose our earth, „deren erste Bestandtheile vielleicht alle aus der Luft niedergeschlagen wurden".[463] As we earlier noticed, fire (or rather "elemental fire") played a prime part in purifying this dense atmosphere. (No doubt it was this same "fire" which consolidated the granite.) The granite eventually became weathered, producing the sand which now covers much of the earth's surface.[464]

It is interesting that Burnet, whose work Herder had read, claimed that the primeval air was full of dust particles,[465] and Buffon, like Herder, believed that water first appeared on the earth by condensation or precipitation from the atmosphere.[466] The physicist Rüdiger, early in the eighteenth century, had also put forward a theory of creation by precipitation; he went so far as to say that the other "elements" evolved out of the air itself.[467] However, Herder does not seem to have read his work. The

illustrious Werner claimed that granite was a precipitate; but it was precipitated within the ocean, not within the atmosphere, and had originally existed in suspension within the waters which once covered the earth.[468] Herder, however, believed (more correctly, as it happens) that fire had assisted in the development of granite, as we have seen.

From all this, we conclude that Herder took over Kant's cosmogony, extending it by adding the theory of precipitation of "elements". The idea of precipitation was really implicit in Kant's work already. The granite theory of Pallas and Goethe was then introduced in turn. The whole inspiration behind this composite theory remains the „Allgemeine Naturgeschichte" of Kant.

f) Earth history.

Herder once says, in the „Ideen", „daß manche Umstände, die jetzt weniger wirken, in frühern Zeitaltern, da alle Elemente noch in ihrer ersten rohen Stärke waren, auch stärker gewirkt haben müssen."[469] The plastic power of these "elements" was especially great around the mountain massif of ancient Asia.[470] Climatic determinants, which first caused the human races to become differentiated, were likewise stronger.[471] Even in the modern age, Herder says, the tropical zone, where the "elements" are stronger, abounds in the largest and most powerful animals, and vegetable growth is most prolific in the same area.[472] Kohlbrugge wrongly says that Herder imagined „die Plastizität der organischen Materie" to have been greater in primeval times;[473] we have seen, however, that Herder believed that the active "elements", not the passive material they act upon, have changed since the earliest times.

The first exponent of this theory was possibly Lucretius, who declared

that the early earth produced larger animals:[474]

> And what in former Times with Ease she bore,
> Grown feeble now, and weak, she bears no more.

Buffon, in his "Histoire des Minéraux" (1783-88), is of the same opinion, as Sauter observes.[475] Kant put forward the same theory in an early essay,[476] and Goethe, in a late study of stratification, declares „daß in den ersten Epochen unserer Erdbildung alles Chemische und überhaupt alles Dynamische kräftiger und stärker gewesen."[477]

However, the potent primeval elements, according to Herder, were not always constructive. Living organisms were often annihilated by „neue Absätze der Luft und des Wassers."[478] This idea is doubtless designed to explain why large layers of fossils are found.

Let us now consider what changes Herder believed had taken place in this more eventful era of the earth's past. He distinguishes two types of „Revolutionen": those which helped to shape the earth at its origin (and which we discussed in our section on cosmogony), and those which the planet has undergone in later ages, even since man inhabited it. We shall now examine this second variety of change.

In 1797, de la Métherie, in his "Théorie de la terre", was able to enumerate over 50 different theories hitherto advanced to explain earth-history.[479] Herder's age, which witnessed the birth of truly modern geology, was fertile in speculative hypotheses too. Since Herder, with his habitual love of synthesis, believed, like the eclectic geologist Pallas, that: "Il faut réunir plusieurs hypothèses modernes, mais non pas s'attacher à une seule cause",[480] we must first decide how all his various ideas should be classified.

Firstly, the so-called "diluvial" theories, which held that all major

convulsions undergone by the earth could be explained as effects of the Noachian Deluge, had long been current. Secondly, there arose the "Neptunist" school of Werner, which maintained that water, above all, had shaped the earth, but over long periods, and not in one universal inundation; this school was soon impugned by the followers of Hutton and Playfair, who, under the name of "Vulcanists", or "Plutonists", declared that "fire" (i.e. volcanic activity) was a greater formative agent in the earth's history. Thirdly, there later began the famous controversy between the schools of Lyell and Cuvier, known respectively as "Uniformitarians" and "Catastrophists"; for, while they might both agree that water and "fire" alike were powerful agents of geological change, the former maintained that changes were gradual, involving similar agencies to those now at work, the latter that they were cataclysmic. These two schools, flourishing from the early to mid nineteenth century, are often confused with the late eighteenth century schools of Neptunism and Vulcanism; but while the ideas of the two groups are often parallel (especially the Vulcanists and the Catastrophists), their similarity is by no means without exception, since, for example, the diluvial theory, the ancestor of Neptunism, might sooner be called Catastrophist than Uniformitarian. We shall use all of these names, without capital letters, as generic terms for certain types of theory, bearing in mind that Herder himself had no part in either of the famous controversies, which both reached their height many years after he had expounded his personal theories of earth-history. First, we shall discuss catastrophist and uniformitarian ideas.

(i) Catastrophism and uniformitarianism.

In one of the rejected manuscripts for the geological portion of the

„Ideen", Herder puts forward the theory that the earth, in its early stages, may have had a more eccentric orbit, not unlike that of a comet. It must later have moved into its present orbit, whose shape is that of a less elongated ellipse. The earlier orbit, Herder infers, took only 360 days for one revolution, as is proved by certain ancient calendars which fixed the year at this length.[481] This, of course, implies that some catastrophic change took place, and that it even happened within the times of recorded human traditions. For, although Herder explicitly rejects the hypotheses of writers such as Buffon and Whiston[482] that the planets were torn forth from the sun, in a molten state (or subjected to some tremendous cataclysm) by the close approach or impact of a comet, he adapts the comet theory to his own purpose, and applies it to the earth itself. His purpose is to suggest that some cataclysmic change befell the earth, and to explain by it, in one comprehensive theory, how many of the planet's present features originated. All other changes, including that in the earth's orbit, are to be explained as the results of one great event: this was a change in the angle of the earth's axis to the plane of the ecliptic.

We must, however, realise that it was not simply the angle of the present axis which supposedly changed in relation to the ecliptic (as if the earth, like a spinning top, had tilted as it spun); Herder thought that the axis of rotation itself had altered - i.e. he supposed that the axial poles themselves had changed (as if a top suddenly began to spin on a new base).

The anomalies in the angles of the planets' axes to the solar ecliptic long troubled certain thinkers, whose aesthetic feelings told them, as with Burnet,[483] that the planets must originally have rotated in a "right posture". The changes they presumed had taken place since then could also

be conveniently used, in the case of the earth, to explain how there came about all the other cataclysms thought necessary to produce the seemingly disorderly and ruinous condition of the planet as it is at present. Surely, the eighteenth century mind felt, the divine architect must originally have designed the earth in more classical style.

Herder was likewise puzzled by the different angles of the planets' axes; he remarks, early in the „Ideen", that no universal law explaining the anomalies has yet been discovered.[484] While his aesthetic sense revolted against the obvious irregularity of the earth's axis, he soon called in teleology to show how beneficial the present angle is for man, since it makes the seasonal changes possible.[485] Soon afterwards he points out the other apparent discrepancy that the earth's highest mountains do not lie round the equator, as they would do if their formation had been governed by the laws of a rotating fluid sphere; in this case again, he justifies the anomaly teleologically.[486]

Rouché singles out the first of these teleological passages, that on the earth's axis and seasonal change. We now cite Herder's German version, followed by Rouché's translation:

> --- so sehen wir abermals, mit welchem feinen Zuge der Finger der Allmacht alle Umwälzungen und Schattierungen auf der Erde umschrieben und bezirkt hat. Nur eine kleine andre Richtung der Erde zur Sonne und alles auf ihr wäre anders. 487)
>
> --- il eût suffi que Dieu modifiât l'inclinaison de l'orbite terrestre sur l'écliptique, et toute l'histoire eût été changée. 488)

Rouché, over-anxious to discover religious orthodoxy in Herder's thought, has personified Herder's „Allmacht", which is an impersonal term. In his „Gott", he says „Wir sind mit Allmacht umgeben, wir schwimmen in einem

Ozean der Allmacht."[489] The word should not be translated by the personal "Dieu" on this occasion either. Herder uses his „Allmacht" in a way typical of his usual immanent teleology, which assumes that the higher purpose and natural causes work together in harmony. Incidentally, the phrase „der Finger der Allmacht" comes straight from Kant's „Allgemeine Naturgeschichte".[490]

But it is clear from the rejected „Ideen" manuscript mentioned above that teleology alone did not satisfy Herder's desire to explain convulsive geological changes. He says of their unknown causes:[491]

> Warum bedörften wir auch eines unbekannten Maschienengottes, da im Bau und in den Lebensaltern der Erde selbst Revolutionen der Art mit allen ihren Folgen nothwendig liegen.

In this manuscript, published by Suphan, Herder attempts to show that both the asymmetry of the earth's axis and the supposedly incongruous situation of the earth's highest mountains can be traced to natural causes. Other incongruities which offended his aesthetic sense, such as the great irregularities in the world's coastlines, and the situation of the magnetic poles at a considerable distance from the axial poles, are explained by the same comprehensive hypothesis.

He first confesses „[daß] freilich mit der Veränderung unsrer Erdachse bisher sehr gespielt worden."[492] For example, Burnet, whom Herder several times mentions, had suggested that the earth was originally symmetrical in all respects, but that a change in the angle of the axis had caused a great upheaval.[493] Whiston and Cluver believed that a comet had caused a similar change, while Whitehurst said that it was brought about by outbursts of "subterranean fire".[494] Sturm was of a similar opinion.[495] The renowned experimentalist Hooke had explained how supposed climatic changes

came about by the same theory,[496] and Pluche, whose work is cited by Herder (as Rouché remarks[497]), had contended that the change was caused directly by God in order to bring on the Deluge as a universal retribution. Scheuchzer, however, whom Herder also quotes (in 1774),[498] held the teleological view that the axis is best the way it is.[499] But even Kant had said that the angles of the planetary axes ought to be regular, at right angles to the plane of the ecliptic, and had attempted to explain the supposed changes by natural causes, saying:[500]

> Meine wahre Meinung geht dahin, daß die Umdrehung der Planeten um die Axe in dem ursprünglichen Zustand der ersten Bildung mit der Fläche ihrer jährlichen Bahn ziemlich genau eingetroffen habe, und daß Ursachen vorhanden gewesen, diese Axe aus ihrer ersten Stellung zu verschieben.

Once again, it was Kant's early scientific thought which inspired Herder directly; it was Kant's approach which encouraged him to explain the change by <u>natural</u> causes. From another remark of Kant's he also realised that the earth's highest mountains <u>could</u> lie near the equator if the axial poles were different.[501]

Kant had even suggested one particular natural cause which could have produced the change. Variations in density caused parts of the earth's crust to collapse:[502]

> --- so hat sie [i.e. die Erde] nicht das Gleichgewicht des Umschwunges in ihrer Axendrehung mehr auf allen Seiten leisten können.

But it is time to examine Herder's theory in more detail. In 1772, he already suggested, in a rough sketch for tutorial purposes, that the Biblical Flood may have caused the axial change.[503] In 1782, he observes more

simply that the earth's axis may have altered.[504] But in the rejected manuscript for the „Ideen", now under discussion, it is no longer the Flood which causes the axial change, but the axial change which causes the Flood; this shows a turning away from the Biblical to a more naturalistic mode of explanation. Besides, it is not the mandate of an irate God, but „ungleich= artige Eintrocknung" of the earth's crust, with ensuing subsidences, which render the axis unstable,[505] just as in Kant's theory.

Bruntsch correctly notices that Herder's approach is quite different from the Scriptural one, which was adopted by such theorists as Lulof,[506] and he observes that Herder's hypothesis is scientifically better founded than similar, earlier ones of Whiston and others, with their comets and arbitrary deities.[507] Nonetheless, most of the credit, which is deserved only by the naturalistic method, not by the speculative, scientifically unverified hypothesis itself, should go to Kant rather than to Herder; for Herder simply tried to combine eclectically all the possible agents of geological change, and to explain away every aesthetically displeasing asymmetry, and finally produced an involved and drastic theory.

However, the theory is not only involved; it is also ambiguous and even at times self-contradictory. For example, Herder remarks that a magnetic field, like that of the earth, with its magnetic poles, is very susceptible to changes, especially from around its equator;[508] this, he believes, is added evidence that the rotational axis of the earth actually did alter. But he had previously assumed that the earth's magnetic poles remained constant, while the poles of rotation altered:[509] this is exactly the reverse of his later statement. Furthermore, the argument that the earth's highest mountains ought to lie near its equator is groundless, because the earth's oblate spheroidal shape, bulging at the equator and flattened at the poles,

neatly conforms to the present axis of rotation, and indicates that the earth solidified with its axis the same as it is now. Herder knew this, as his references to the earth as a spheroid[510] and to Bouguer, Condamine and Maupertuis,[511] the men whose expeditions proved that the earth is an oblate spheroid, indicate; he seems simply to have ignored the implications of this fact, and, undaunted, reapplied the theory of rotating fluid spheres to the Asian „Erdrücken" rather than to the equatorial bulge, just as Kant had done in 1755.

We shall now briefly discuss the further catastrophes which Herder believed had occurred in the earth's past. He rejects all theories which maintain that earlier worlds, with their lost civilisations, have been totally destroyed (presumably because he could not accept historical catastrophes so readily as geological ones). He declares:[512]

> Die Systeme also, die von zehnfacher Veränderung der Weltgegenden und Pole, von hundertfältiger Umstürzung eines bewohnten und cultivirten Bodens, von Vertreibungen der Menschen aus Gegend in Gegend oder von ihren Grabmälern unter Felsen und Meeren reden und in der ganzen ältesten Geschichte nur Graus und Entsetzen schildern, sie sind, trotz aller unleugbaren Revolutionen der Erde dem Bau derselben entgegen oder von ihm wenigstens unbegründet.

Probably Herder has in mind the cataclysmic theory of Bonnet, who believed that all life, except the "germs" of new and superior forms, is periodically destroyed. But, as we have seen, the hypothesis in his own discarded manuscript on the earth's axis is almost as catastrophic as the theories he attacks, for it assumes that the axial change occurred <u>after</u> man had appeared on the earth. However, he had rolled all his cataclysms into one in this version, and had associated them with the teleologically justifiable Noachian

Deluge. But, on other occasions in the „Ideen", his own catastrophist views become quite fantastic, as when, carried away by his imagination, he depicts a geological holocaust, a primeval ocean which boiled („siedet") „von jenen Vitriolgüssen und andern Materien."[513]

The notion that huge caverns arose within the earth as it consolidated appears early in the „Ideen".[514] As we have seen, he also used the same theory, with the corollary that the caverns cause huge subsidences, to explain how the earth's axis was shifted. The opening of these „Klüfte und Hölen" [sic][515] caused earthquakes, tidal waves and other convulsions, as we shall shortly see.

Bruntsch lists some earlier examples of the theory of subterranean caverns, naming Aristotle, Leibniz, Whiston, Woodward, Scheuchzer, Pluche, de Luc and Kant as previous exponents of it.[516] To these we may add Anaxagoras,[517] Ovid,[518] Lucretius,[519] Seneca,[520] and Albertus Magnus;[521] in fact, it was used throughout antiquity as an explanation of earthquakes. Pallas had also used the theory to explain supposed cataclysms,[522] and Du Bos, whose work Herder knew, had suggested, perhaps basing his hypothesis upon a fanciful etymology of the word "Holland", that that country, now flat, once boasted numerous hills, which unhappily proved to be hollow.[523]

Nearly all of Herder's more catastrophic theories of geology appear in rejected manuscripts for the „Ideen". As Suphan notes, red lines appear against several such passages, and are probably Goethe's work.[524] (We shall discuss Goethe's influence later.) But we have seen enough to show us that Herder, in the early 1780's, was spontaneously inclined to interpret geology catastrophically, and that uniformitarian ideas have no place in the writings hitherto discussed. We shall discuss his more uniformitarian arguments in our section on neptunism.

(ii) Diluvial theories.

In an early sketch entitled „Zur Geschichte der Wissenschaften aus Boulanger",[525] dated by Suphan at around 1766,[526] Herder repudiates the ideas of Boulanger, who, in a work published in 1766, claimed that he could detect vestiges of the Noachian Deluge in topography and human customs throughout the world. Herder concludes that this theory is the product of a mania which had developed out of Boulanger's constant work with water as an overseer of dykes,[527] and writes:[528]

> Wer sagt es ihm, daß, wenn auch in allen Ländern Spuren von Sündfluth seyn sollten, diese Ueberschwemmungen alle auf einmal gewesen?

In 1769 he says that, as natural historians have proved, fossil beds were often deposited when tracts of land were submerged for „Jahrhunderte", not just for a few days, and that Noah's Flood is of merely national character.[529] He next says of the Flood in 1782, „so gehörte sie gewiß zu den Naturgesetzen der sich bildenden Erde", adding that much of the earth was submerged for prolonged periods, and that isolated inundations occurred frequently[530] (no doubt because the primeval "elements" were more active). In the „Ideen", he calls the account of Noah „eine Nationalerzählung", and says that, although natural history records traces of a great inundation, especially in Asia, a plurality of Noahs may have survived in various lands.[531] In the earliest manuscripts for the geological parts of the „Ideen", he reinstates the one near-universal deluge, but also invokes vulcanistic agencies in explaining it, as we shall see.[532] And he next decides, in the slightly later manuscript on the earth's axis, that a great deluge was produced when the planet's axis became unbalanced. In evidence for this he mentions the irregularity of the southern coastlines of the great land masses; this

physical feature, as well as the observation that southern capes and inlets often run parallel, had already puzzled such travellers as Reinhold Forster, as Herder points out.[533] He still regards the Noah story as a „National=sage", however.[534]

Thus, we see that Herder never accepted the Biblical narrative on the Deluge literally, but, after first saying that the inundations indicated by marine fossils were protracted events in the earth's development (the uniformitarian view), he later proceeded to integrate the diluvial hypothesis into a composite, thoroughly catastrophist theory of geological development in the earlier manuscripts for the „Ideen". On this evidence alone, we must greatly qualify the critic Wells' comparison between Herder's and Hutton's views on geology. Wells writes as follows:[534a]

> --- Herder's views seem more akin to the Scottish writer's uniformitarian hypothesis --- than to the hypothesis which attributed all past change to sudden and violent convulsions such as the Mosaic flood.

On the contrary, Herder did invoke just such convulsions, as well as others such as the supposed change in the earth's axis, although he also believed that more gradual and familiar forms of change have contributed to the earth's formation.

Zöckler, in his history of theology and science, remarks of the period 1650-1780:[535]

> Diluvialismus ist der Grundcharakter der schöpfungsgeschicht=lichen Theorien unsres Zeitraums.

No thinkers seriously doubted that one or more widespread floods had occurred at some time or another, as fossil beds suggested.[536] They differed only in the degrees to which they accredited the Scriptural narrative. Already

in the seventeenth century, a few bolder thinkers said that Noah's Flood may have been local or national,[537] just as Herder and others later did. Leonardo, earlier still, was perhaps the first to put forward this idea.[538] Unlike those, such as Reyher in 1679[539] and Scheuchzer in 1731,[540] who invoked a direct miracle as the cause of the Deluge, Herder relied upon natural causes. These, however, were also part of a higher, teleological system, and Herder regards the Mosaic account as valid evidence that the Flood took place;[541] on the other hand, he regards the myths of other ancient peoples as evidence of equal value.[542]

Once again, we may recall that Kant had entertained a very similar opinion to Herder's; both at some time employed the idea that the earth's crust, undermined by vast caverns, had subsided, thereby causing the planet's axis to alter, and thus in turn causing a great inundation.[543] The eclectic geologist Pallas, like Herder, incorporated one or more near-universal floods into his theory;[544] but Pallas postulated volcanic outbreaks as the cause, just as Herder had done in his earliest manuscript for the „Ideen", before he gave preference to Kant's subsidence theory.

We conclude that, in amalgamating the diluvial hypothesis with his piecemeal theory of geological catastrophe, Herder was not subordinating science to theology, but was bending both kinds of argument in order to reconcile them. Diluvial theories, furthermore, had been typical of geological thought throughout the century, and were only beginning to pass out of currency when Herder wrote his „Ideen".

(iii) Vulcanism.

Herder believed that the "elemental fire" which helped to form the earth in its earliest stages still lay dormant, in fairly large quantities, in the

interior of the earth:[545]

> Welche unendliche Menge groben Feuers z.B. riß die Steinmasse unsrer Erde an sich, die noch in ihr schläft.

He sometimes equated this archaic "fire" to electricity, as we have seen. It is therefore not surprising that, since volcanic activity is likewise caused by "elemental fire", Herder says that it too is of an electrical nature.[546] But this view was fairly current at the time. Karl August enquires in a letter to Merck in 1780 what effects electricity has upon men during volcanic eruptions.[547] Similarly Du Bos believed that thunder and lightning are ultimately produced by the earth[548] (no doubt by exhalations), and W. Stukeley, whose works Herder does not seem to have known, claimed that earthquakes are caused by electricity.[549] Probably volcanic lightning, which is often produced by the friction of erupted particles in the atmosphere above volcanoes, gave rise to such beliefs.

As we remarked in our previous section, Herder's earliest manuscript for the geological portion of the „Ideen", written before 1784, explains the Deluge by vulcanistic agencies. It is interesting to compare this with one of Kant's ideas, advanced in his „Kritik der Urteilskraft" in 1790; Kant here considers that the world's irregular coastlines are the product of „wilder, allgewaltiger Kräfte".[550] Herder had said of the great inundation which helped to carve out the great inlets:[551]

> --- die nähere Ursache, die sie vollständig erklärt, liegt uns vor Augen --- wo tiefe Meerbusen sind, finden sich jedesmal ausgebrannte oder feuerspeiende Berge in der Nähe.

Similarly, Pallas thought that convulsions around the Indian Ocean had been caused by earthquakes and volcanoes,[552] but his pseudo-vulcanistic idea

that volcanic eruptions result from the combustion of subterranean organic deposits finds no echo in Herder's belief that "elemental fire" is the source of volcanic activity.

In his later manuscript on the earth's axis, Herder uses Kant's subsidence theory to explain the initial change of the earth's axis and the resultant inundation. Nonetheless, even in this later version, he still invokes volcanic activity, for good measure, saying that it assisted the work of the flood by fortifying certain coastlines with lava, and weakening others by explosive eruptions.[553)]

Herder was too fascinated by volcanoes to omit them from his dramatic theory of earth-history. He had read the Fürstin Esterhazy's descriptions of Vesuvius, and made copious excerpts from the notable accounts of volcanoes in general by Hamilton and Soulavie, published in German in 1784.[554)] At least three other works of this kind, on Etna, Vesuvius, and the earth's interior respectively, found a place in his library.[555)]

Thus, to his general catastrophist theories, Herder added diluvial and vulcanistic ones; we shall next see that neptunian theories also play a part in his complicated conception of earth-history.

(iv) Neptunism.

Herder's interest in the sea is especially conspicuous in his „Journal" of 1769, but it lasted on throughout his life. Not surprisingly, therefore, he thought that the sea had fulfilled an important task in the shaping of the earth. We shall now ignore his diluvial theories, which have already been discussed, and pass on to examine the less spectacular and more constructive functions of the sea in the earth's history as he envisaged it.

Already in 1782, in his „Vom Geist der ebräischen Poesie", Herder says

of the earth:[556]

> Aus Waßern hat sich diese langsam gebildet: Waßer haben lange und in verschiedenen Perioden über ihr gestanden.

Even in 1780, he had considered writing a prize essay for the Académie des Inscriptions on the topic: "Rechercher ce que les monuments historiques nous apprenent des changemens arrivés sur la surface du globe par le déplacement des eaux de la mer."[557] In his classified notes for the „Ideen", there appears the reference „Bildung der Erde aus Wasser", as Suphan notices.[558] The first „Ideen" manuscript on geology, with Goethe's red lines against the more catastrophist passages, contains the phrase „der Aufbau der Erde aus dem Wasser",[559] and in the „Ideen", Part II, Herder says that America „einem großen Theil nach wahrscheinlich später aus dem Schoos des Meers gestiegen war, als die andern Welttheile."[560] Earlier in the same work he says that lands near the sea are always of later origin than are central highlands.[561] And finally, we should remember Goethe's remark, quoted by Suphan, concerning discussions with Herder while he was writing Part I of the „Ideen":[562]

> Unser tägliches Gespräch beschäftigte sich mit den Uranfängen der Wasser=Erde und der darauf von altersher sich entwickelnden organischen Geschöpfe.

Thus, by 1782, Herder had come to the conclusion that the continents (apart perhaps from their granite peaks) originally emerged from the sea. This was <u>before</u> his old friendship with Goethe was renewed in the following year. And the reference „Bildung der Erde aus Wasser" in his classified notes, giving a volume and page number in the „Abhandlungen der königlichen schwedischen Akademie der Wissenschaften", shows that he had independent

sources for his belief. The article in question, written in 1743 by A. Celsius, begins as follows:[563]

> Man hat schon viele Beweise, welche einhellig darthun, daß Schweden sowol [sic] als andere Länder auf dem Erdboden, vorzeiten Boden der See gewesen ist.

Curiously enough, the writer goes on to suggest that Northern Europe was suddenly inundated from East to West, just as Herder does in his manuscript on the earth's axis, and later adds that the flood waters may have drained away into cavities within the earth.[564] This article exhibits the same blend of neptunian (and uniformitarian) ideas of continental growth and the more archaic diluvial (and catastrophist) hypothesis as we find in Herder's „Ideen". It is therefore almost certain that this article of Celsius' had a greater influence upon Herder than had Goethe's more exclusively neptunian ideas.

We have already seen that Herder, like Pallas, believed that the continents arose from the seas through the gradual accumulation of detritus eroded from central granite massifs. Thus it was inevitable that he should believe that the earth had undergone a neptunian phase, as many writers, such as Buffon,[565] Linnæus[566] and de Maillet,[567] all of whom Herder mentions at various times, had previously maintained. Such neptunian theories, often combined with diluvial, or even vulcanistic ideas, mark the transition, which took place around the time of Herder, from the earlier, purely diluvial phase of geological thought to the ideas of Werner and the resultant controversies which were the birth-pangs of modern scientific geology.

One further remark on early neptunian theories seems necessary. The Swedes, for example Celsius and Linnæus, were particularly convinced that the continents had risen from the waters, since Sweden, then as now, was seen to

be rising quite perceptibly. It is now known, however, that this country has been rising only since it was released from the weight of the last quaternary ice-sheet, which began to melt some 20,000 years ago.[568]

We have seen that Goethe encouraged Herder's more neptunian theories, and censured his catastrophist and vulcanistic ones; this was, as he wrote to Zelter, because he believed that nature employed „einfachere und grandiösere Mittel" than Herder thought, as Suphan appropriately observes.[569] But Herder was later to hear the Neptunian doctrine from the mouth of its ablest exponent - Werner of Freiberg. Caroline writes in her memoirs:[570]

> In Aachen, 1802, wo auch Werner zu gleicher Zeit mit uns da war, hatte derselbe die Güte, Herders Wißbegierde zu befriedigen, und ihm mündlich in mehrern Stunden einen Abriß seines Systems mitzutheilen. Herder hatte eine ausnehmende Freude darüber.

It would thus seem probable that Herder was finally converted to the Neptunist school of geological thought. We shall return to this question in our conclusion.

(v) Conclusion.

R. Noll writes: „die Katastrophentheorie [of Cuvier] findet in Herder einen wankellosen Vorkämpfer."[571] This statement, like all one-sided interpretations of Herder's works, cannot be accepted without great qualification. We have seen that Herder supported all the important geological hypotheses elaborated or inherited by his age, combining them all together in his early manuscripts for the „Ideen", and placing varying emphasis upon the separate ingredients of his composite theory at different times; later he apparently became more or less converted to Werner's views, under the personal influence of that gifted lecturer. But at that transitional period in geology during which he wrote his „Ideen", diluvial theories were still in

use, and vulcanism and neptunism, catastrophism and uniformitarianism had not yet crystallised into the mutually exclusive, self-sufficient systems they later became; it was still possible for Herder to believe to some extent in each way of thinking, just as every geologist of today is prepared to use any of the four last-named theories as the evidence before him demands.

Herder once said that the study of earth-history should prepare us for „die Hinfälligkeit und Abwechslung aller Menschengeschichte."[572] But this does not explain why his theories, which can all be traced separately to the works of various scientific thinkers, are so complex in their composite form. We have already seen too often how Herder would find where the opposite extremes of a subject lay, then try to reconcile its disparate implications, rarely adopting a one-sided view, especially in his mature period. This tendency, inherent in his nature, in conjunction with his reading, determined the character of his purely speculative geological theories.

Herder's reading on geology, as should now be obvious, was very extensive. Besides the very numerous works of the writers we have here mentioned, his library contained at least ten more volumes dealing exclusively with earth-history.[573] As so often, we have again seen that his greatest debt was to his old teacher, Kant. It is no wonder that, so soon after he had written these passages on geology, often under Kant's influence, he felt deeply wounded when Kant's scathing review of the „Ideen" Part I appeared. Probably Kant felt particularly impatient with Herder's ideas, as we have said before, because they embodied so much of his own precritical thought, from which he had now resolved to dissociate himself. Individually, Herder's theories can all be traced to various earlier authors. What originality they possess, they have by virtue only of their unusually complex combination.

The most interesting and characteristic of Herder's geological writings

remained unpublished during his own lifetime. We know that Goethe's influence, perhaps seconded by that of Einsiedel, a pupil of Werner's, was responsible for their suppression. It is noteworthy that Caroline mentions an essay „Revolutionen der Erde" in a letter of 1807 to Johannes von Müller, who was helping to edit Herder's complete works.[574] K. Hoffmann, the editor of the recent volume in which Caroline's letter is published, says that this reference is to „ein verlorener Aufsatz Herders, der von Alexander von Humboldt gelesen und beachtet wurde, von August Herder aber für die Aufnahme in die Sämtlichen Werke abgelehnt wurde."[575] This information seems to be based upon unpublished letters in the Schaffhausen Ministerial=bibliothek. If we did not know that Herder's manuscript on the earth's axis was published in the edition of his works supervised by Caroline and Georg Müller,[576] we should be tempted to suppose that this was the "lost" essay. However, the lost work was almost certainly yet another version of the geological parts of the „Ideen", and probably advanced some other drastic theory of earth-history. For August Herder, himself a pupil and protégé of Werner, probably felt that his father's earlier catastrophist and vulcanistic ideas deserved to pass into oblivion, particularly since Herder himself had eventually come to admire Werner, and, already in 1792, had written in his „Tithon und Aurora":[577]

> Nicht Revolutionen, sondern Evolutionen sind der stille Gang dieser grossen Mutter [i.e. nature], dadurch sie schlummernde Kräfte erweckt, Keime entwickelt, das zu frühe Alter verjünget, und oft den scheinbaren Tod in neues Leben verwandelt.

Though not referring to geology, Herder here expresses the more classicistic views of his post-Italian years. This, no doubt, made it easier for him to

agree with Werner; but, unfortunately, he left no statement of his final opinions on the history of the earth.

Herder lived at a time when geology was entering its most crucial phase. Already in the „Ideen", he had said that a unified theory of cosmogony, with comprehensive laws, could soon be expected to follow after the beginnings had been made by such men as Buffon.[578] (Such a theory did appear with the work of Laplace in 1796.) With the extensive field studies of stratification pioneered by Werner and others, and the great work of William Smith, who determined the sequence of the rocks with unprecedented thoroughness, geology became a truly empirical science; the new understanding of the enormous time-scale, of the gradual changes and astonishingly varied developments in the earth's past, raised the geology of the middle and late nineteenth century far above the circumscribed speculative doctrines of the previous age.

Perhaps Herder realised that his own theories belonged to a more archaic phase, in which discovery had not kept pace with imagination. Caroline says:[579]

> In den letzten Jahren so mannichfaltiger Entdeckungen, unter welchen er Werners geognostisches System vorzüglich schätzte, wünschte er manchmal, erst jetzt geboren zu seyn, um die Resultate, die sie herbeiführen, zu erleben.

g) The future of the earth and the solar system.

We now come to the chronological antithesis of the problems of origins and cosmogony; it is the problem of how our part of the universe, and the earth in particular, will eventually end. For Herder, unlike Goethe, was equally ready to contemplate first and last things.

Grundmann says of Herder's theory that the earth may one day fall into

the sun:[580]

> Diese Ausführungen erinnern an Kants und Eulers Mutmaßungen über das Altwerden unseres Planeten.

A passage in Herder's unpublished „Anfangsgründe der Sternkunde" of 1765 strikingly confirms the ~~first~~ second half of Grundmann's conjecture:[581]

> Da die Erde in dem feinen Aether worin sie sich fortstöst [sic] immer eine kleine Hinderung hat: --- die Laufbahn der Erde muß sich also immer etwas mehr der Sonne nähern und eine feine Spirallinie machen. Euler ist der [sic] diese Annäherung zur Sonne durch Beobachtungen zu bemerken gesucht hat.

On the other hand, Herder says in the „Ideen":[582]

> Die schöne Schopfung arbeitet sich zum Chaos, wie sie aus einem Chaos sich herausarbeitete.

Similarly, Kant declared in his „Allgemeine Naturgeschichte" that the chaos out of which the universe progressively emerged will once again engulf it „durch einen allmählichen Verfall der Bewegungen",[583] and then spoke of the increasing „Mattigkeit" of the planets,[584] just as Herder speaks of „die alternde Kraft der Erde, die sich nicht mehr zu halten und fortzutreiben vermag."[585] (This recalls the animistic theory of gravity.) The other half of Grundmann's statement is thus also corroborated.

Herder seems to have believed all his life that the earth will eventually be destroyed by approaching the sun too closely. This idea appears again in the 1769 manuscript recently published by Irmscher,[586] and also in a sermon on the afterlife, probably delivered late in the previous year.[587] As we have seen, it recurs in the „Ideen".

This doctrine has a long history. The Stoics declared: "All things began with fire and will end in it."[588] Burnet, whom Herder mentions at

various times, believed that the earth will eventually be destroyed by fire,[589] and the idea received some support from Christian eschatology. Euler (and to a lesser extent Kant) tried to base his theory of the future of the solar system upon more scientific premises, but it was not until 1824, when Carnot formulated the second law of thermodynamics, that the notion of a gradual "running down" of the universe became a physical law. When Michelson and Morley, in the late nineteenth century, found that "ether resistance" to the earth's movement is impossible to detect, the older theories of a gradual approach to the sun became obsolete. But the "heat-death" theory survives in the less spectacular conception of entropy, and some astronomers believe that the sun may eventually expand so as to engulf the earth.

Herder realised that scientific theories of doom conflicted with that belief in progress which he came to support increasingly in his mature and later years. In the „Ideen", he apologises rather lamely for the earth's descent into the sun:[590]

> --- was geschähe anders, als was nach ewigen Gesetzen der Weisheit und Ordnung geschehen mußte?

Some years later, he adds the observation that the earth will end only after man's rôle is fulfilled,[591] thus returning to the teleology he had meanwhile repudiated.

Unlike Pallas, Bonnet and others, Herder does not suggest that great geological cataclysms may again overwhelm the earth. No doubt he felt that the earth, now lacking its pristine vigour, has become incapable of producing further convulsions on a large scale.

6. Meteorology.

As we shall see when we come to examine Herder's conception of environmental determinism, his definitions of climate correspond approximately to modern definitions of the whole natural environment in relation to man. Thus, we look in vain in his works for any theory of climatology in the narrower sense.

Herder's thoughts on meteorology in particular are equally imprecise. Instead of attempting to describe and classify the known phenomena governing atmospheric changes, he prefers to speculate upon unknown „Kräfte" which may be at work in the air. In the „Ideen", for example, as we have already noticed, he suggests that magnetism, as well as the other "elements" which act in the atmosphere, may influence climate.[592] Unseen „Himmelskräfte" operating in the aerial „Medium" may, when discovered, provide material for „eine geographische Aerologie". Herder even adds:[593]

> Die Bildung der Menschen an Körper und Geist wird sich mit daraus erklären.

Close upon this audacious claim, there follows the remarkable passage on astrology which we mentioned in a previous section:[594]

> Das ganze Himmelssystem ist ein Streben gleich= oder ungleich= artiger aber mit großer Stärke getriebner Kugeln gegen einander --- Werden einst alle diese Bemerkungen und ihre Resultate auf die Veränderungen unsrer Luftkugel angewandt werden, wie sie bei der Ebbe und Fluth schon angewandt sind: so wird, dünkt mich, die Astrologie aufs neue in der ruhmwürdigsten Gestalt unter unsern Wissenschaften erscheinen.

Thus, unlike Goethe, who insisted upon a purely "tellurial" theory of meteorology,[595] Herder believes that unseen virtues inherent in other cosmic bodies may influence the earth's weather. Kepler had likewise thought that

astrological "aspects" can influence the earth's "intelligent soul", so that "strong aspects" cause thunderstorms, and so on.[596]

It is curious that Herder should mention the tides in this connection. In the „Journal" he writes:[597]

> Wie sich Welle in Welle bricht: so fließen die Luftundulationen und Schälle in einander.

In fact, he frequently compares water and air, water-waves and atmospheric waves (and, as we have seen, fishes and birds). Similarly, Goethe believed that effects analogous to tides are manifest in the atmosphere, but are caused by the "breathing of the earth".[598] (Leonardo had said that the oceanic tides follow the "breathing of the world",[599] and Kepler too saw them as a symptom of the "breathing of the earth body".[600]) It would surely have interested both Goethe and Herder to learn that, for the past 40 years, actual tides have been observed by scientists in the earth's atmosphere. These are caused by the moon's attraction, and have recently been found to influence rainfall on the earth.[601]

Herder had read works by several writers who discussed meteorological phenomena. But nearly all of these treated climate only as an environmental determinant acting upon man, not as an object of scientific study in itself. For example, in a review dating from 1765, Herder draws attention to Du Bos' theory that „Ausdünstungen der Erde" can influence man. We shall return to such ideas in our section on environmental determinism.

However, it is typical of Herder that he is more interested in the „Kräfte" which work in the atmosphere than in quantitative criteria such as temperature, air-pressure, rainfall, etc. Meteorology is one of the sciences about which he has least to say. Admittedly, it had scarcely

emerged as an autonomous discipline in his day. However, what he did say was already archaic, and simply confirms our contention that only ill consequences could result for his scientific ideas when he failed to realise the importance of quantitative methods and the worthlessness of his unseen „Kräfte".

7. Geography.

It has not seemed advisable to devote a detailed chapter to geography as a whole, for Herder did not treat the subject systematically and in isolation, and since, by its very nature, it encompasses so many diverse branches of science. We may note, however, that Herder was keenly interested in it from the time when he attended Kant's lectures on physical geography in Königsberg onwards. He also appears to have taught it, in schools at Königsberg or Riga, or as a private tutor, since he later declares „[daß] ich sie [i.e. die Geographie] selbst in den besten Jahren meines Lebens mit dem äußersten Vergnügen gelernt und mit eben so viel Vergnügen andre gelehrt habe."[602] His library contained at least 48 volumes on geography, and 46 atlases and maps,[603] as well as numerous travelogues. Furthermore, he delivered an excellent „Schulrede" on geography in Weimar, probably in 1784; it was entitled „Von der Annehmlichkeit, Nützlichkeit und Nothwendigkeit der Geographie".[604] Although the main purpose of this address was to demonstrate the educational value of the subject, it also reveals several characteristic features of Herder's attitude to it. For example, it is clear that he believes it to be fundamentally a scientific subject, since he names physical geography as the necessary foundation upon which all else must rest.[605] Geography teaches us that the earth is governed by natural laws, he contends, and he describes the student's delight „wenn er einsehen lernt,

daß was ihm in der Gestalt der Erde sonst Chaos war, auch seine Gesetze und Ordnung hat."[606] He completely rejects the time-honoured fallacy that it is simply a dry catalogue of countries, rivers, frontiers and towns,[607] and it is the Herder of the „Ideen" who exclaims that geography is inseperable from the history of the earth's peoples.[608] He concludes:[609]

> --- ich darf sagen, daß die Geschichte ohne Geographie so wie ohne Zeitrechnung grossentheils ein wahres Luftgebäude werde. --- Kurz die Geographie ist die Basis der Geschichte und die Geschichte ist nichts als eine in Bewegung gesetzte Geographie.

Indeed, we have already seen how large a part the whole subject occupies in Herder's greatest work. We have dealt with most of his views on physical geography in our section on the geological or earth sciences, and examined his attitude to landscape at the beginning of our chapter on scientific methods. We shall further discuss his theory of climate and environmental determinism (already briefly mentioned in connection with meteorology) in the following chapter, which will be devoted to biology, and human geography will receive our attention in the section on human races. As for Herder's general knowledge of the countries and peoples of the earth (i.e. of general descriptive geography), a critical appraisal of most of the travelogues and general geographical descriptions he read and used will be found in Grundmann's commendable work on the „Ideen".[610]

We need only add that, apart from a few errors arising out of the limited knowledge of his age (e.g. he says: „Die Cordilleras sind die höchsten Gebürge der Welt"[611]), Herder had an accurate and diversified knowledge of nearly all aspects of geography, and he used it as an explanatory commentary on universal history to a much greater extent than most theorists of history before or since his time.

CHAPTER II

The Biological Sciences.

Introduction.

Herder's knowledge of natural history was considerable. We know from a memoir submitted by the Oberamtmann Crüger to Caroline,[1] and utilised for her own „Erinnerungen",[2] that the youthful Herder, about to become a student of medicine at Königsberg, embarked upon studies of botany with the help of his patron, the army surgeon Schwarz=Erla. He came to possess many of Linnæus' works,[3] and frequently mentions this authority, along with other botanists, throughout his works, although, as we know, he disagreed with his system. In the „Journal", he rightly exclaims that the sea holds a new world for the botanist,[4] and, in the „Ideen", he expresses the wish that „eine allgemeine botanische Geographie für die Menschengeschichte" will be elaborated.[5]

In our section on classification, we noticed that Herder was likewise interested in general zoology. For example, he devoted parts of his language essay of 1770 to the problems of animal instinct. The „Ideen", and Herder's preparatory notes for that work, abound in references to the natural history of animals, and numerous zoologists are mentioned throughout his writings. The author of the newspaper article „Herder und die Tier=seele" has collected nearly all the references to animals in Herder's works;[6] this article should be consulted for proof that his factual knowledge of natural history was indeed extensive.

However, it is not our purpose to discuss natural history, or to enumerate Herder's citations of purely descriptive facts. These are mentioned only where they throw light on his knowledge of texts of scientific

interest, or on his use of some scientific method or principle. We shall thus pass on to study his thoughts on scientific or functional biology, bearing in mind that, in Herder's day, botany and zoology were still largely occupied with taxonomy and natural history. Nonetheless, although the word "biology" was not coined until after 1800, the all-embracing study of life and its functions had already begun, and we shall now examine some of these more comprehensive theories of life as they appear in Herder's works.

1. The nature of the biological world: definitions of life.

a) Specific definitions of life.

In our sections on a universal "medium" or ether, on electricity, light, heat and on the chemical "elements", we found that Herder uses every one of these supposed „Kräfte" to describe the elusive "life-force" itself. It was never completely clear whether these „Kräfte" (which he often reduces to subtle material substances) are the "life-force" or whether we should consider them only as imperfect and approximate analogies, which is what he himself sometimes calls them. We shall now examine some of his further attempts to reduce the "life-force" to some specific agency.

Firstly, he often says that our breath, the air, or some vital ingredient of the air, is essential to life:[7)]

> --- die innere Oekonomie des animalischen Lebens aber hangt [sic] von dem verborgnen Reiz oder Balsam im Element der Luft ab --- und so wird wirklich der Mensch durch den lebendigen Othem zur regsamen Seele. Durch ihn erhält und äußert er die Kraft, Lebenswärme zu verarbeiten.

On the one hand, this notion, as Herder uses it, looks back to such ancient

ideas as the "pneuma" of the Stoics, the divine afflatus, and, as Rouché points out,[8] to the divine logos of St. John; we discussed such ideas in our introductory chapter as religious applications of the „Kraft" principle. On the other hand, the same notion received a new scientific stimulus from the experiments which Priestley and others, in Herder's lifetime, carried out upon oxygen, a recently discovered gas already known to be essential to most living organisms. Similarly, Boyle had earlier entertained "a great suspicion of some vital substance, if I may so call it, diffused thro' the air."[9] It would accordingly be wrong to emphasise only the religious or mystical affinities of Herder's ideas on breathing.

Secondly, his mention of „Lebenswärme" reminds us of those theories of "animal heat", so often used in that age to explain the nature of animal vitality. "Animal heat" first became interpreted in a genuinely scientific way when Joseph Black put forward the theory that body-heat is produced by combustion which takes place during respiration; this theory was improved upon by Crawford's experiments, published in the Transactions of the Royal Society in 1781.[10] Herder cites this (then recent) article, along with a similar work by the chemist Crell;[11] this shows once more how up to date his scientific knowledge often was, and that his notion of „Lebenswärme" had some scientific support. But along with the cautious experimental conclusions of Crawford upon the maintenance of body-heat in animals, there appear, in the „Ideen", those more archaic theories of animal heat, "elemental fire", light and "inner ether", already examined in the appropriate sections. Such attempts to describe life in terms of heat or "fire" go back to Aristotle, Democritus,[12] and even Heraclitus.[13] Linnæus, like Herder, preferred to use several of these ancient pseudo-chemical theories of life in

an eclectic combination, saying that the living body is a machine kept going by an "ethereal electric fire maintained by breathing".[14)]

But apart from these vacillating attempts, still common in the late eighteenth century, to compare or even to identify life with imperfectly understood chemical processes or physical "forces", there existed other theories which defined life in purely biological terms. Popular tradition, probably inspired by the words "the blood is the life" as set forth in Deuteronomy 12, 23,[15)] held that the vital principle resides within the blood. Thus the young Georg Müller, staying with Herder in 1780, writes in his diary, probably after a conversation with Herder:[16)]

Im Blut steckt ein besonderes thierisches Leben.

A more modern, bio-chemical conception of the vital composition of living forms is that of "protoplasm". It has been much valued by materialistic thinkers, and is widely used, even today, in elementary biology. Now in the „Ideen", Herder once calls his general animal "type" a „Prototyp"; on the following page, in Suphan's edition, he calls it a „Hauptplasma der Organisation".[17)] Bärenbach, the first of that line of one-sided critics who hailed Herder as a precursor of Darwin, seized upon the word „Hauptplasma",[18)] and identified it not only with Haeckel's evolutionary „Urzelle", but also, as Schmidt-Cürtow[19)] and Rouché[20)] point out, with the modern "protoplasm", but he forgot that Herder's „Hauptplasma" is a <u>form</u> or <u>pattern</u> of organisation, not a fundamental organic <u>substance</u> like the modern protoplasm. Bärenbach's absurd and hasty inference merits no further attention in itself, but it does raise an interesting question in the history of scientific terminology. For no critic has yet noticed that Herder, in his „Zerstreute Blätter" of 1785, uses the actual word „Protoplasma" to describe his universal "type".[21)] Although his term and the modern equivalent, on this occasion again, have quite

different meanings, there is no denying that he uses this significant word long before the conception with which later biologists associated it had been even tentatively formulated.

The process by which Herder arrived at this striking word is simple. He combined the words „Prototyp" and „Hauptplasma", which he had used in juxtaposition in the „Ideen", perhaps following the model of the old term "protoplast", often used by theologians to describe Adam, the first-made man. Elsewhere, he uses similar words himself, such as „Protevangelium" [sic][22] and „Protoapostel"[23] in theological contexts in 1797; on one occasion, in 1799, he actually describes the first men as „Protoplasten".[24]

The „Deutsches Fremdwörterbuch" of Schulz and Basler states that the word „Protoplasma" (as distinct from „Protoplast") was first used in 1846 by the botanist Hugo von Mohl,[25] and a similar reference work by Darmstaedter, referred to in Schulz and Basler, claims that Purkinje first coined the word in 1840.[26] The Oxford Dictionary first records the word in English in 1848. But while it is true that nineteenth century scientists first gave the word its modern meaning, Herder had used it, in a biological context, over half a century before them, probably for the first time. It is quite possible that von Mohl or Purkinje originally encountered it in Herder's works.

The last of Herder's many attempts to describe life in terms of some specific agency is his neurological theory, borrowed chiefly from Haller. Since it is of great importance for his psychological ideas, we shall discuss it in our chapter on psychology and human physiology, ignoring it for the present.

b) Vitalistic theories of life.

As we have often observed, Herder usually classes his ethereal "medium",

electricity, light, heat (or "elemental fire"), and all the other nebulous terms he uses in describing life, as „Kräfte" (although he reduces them at times to material substances). He likewise assimilated Haller's three physiological reaction-processes - „Elasticität", „Reizbarkeit" and „Empfindung", as Herder calls them - into his own philosophy of „organische Kräfte", and even suggested that they were basically manifestations of one and the same „Kraft".[27] Thus, the one common factor behind all his many conceptions of life is „Kraft", that same unknown "force" which is encountered in all vitalistic theories of biology, even in the present century. His pseudo-chemical definitions of life are simply variants upon, or more materialistic deviations from the fundamental vitalism in his entire biological thought.

Sources for his vitalistic ideas are not far to seek. In the „Ideen", he himself lists Hippocrates, Aristotle, Galen, Harvey, Boyle, Stahl, Glisson, Gaubius and Albin as earlier exponents of an unknown vital principle.[28] Clark names Aristotle, Boerhaave, Haller and Leibniz as men who held vitalistic ideas similar to Herder's.[29] Galen had actually named over 60 kinds of vital force or "dynamis" residing in the human body;[30] other like theories suggested by thinkers known to Herder were Hoffmann's "vis vitalis solidi",[31] Huarte's "vitall spirits",[32] Hufeland's „Lebenskraft",[33] Kielmeyer's „organische Kräfte",[34] Needham's "force végétative",[35] Blumenbach's "nisus formativus"[36] and C.F. Wolff's "vis essentialis";[37] however, he did not encounter the ideas of a few of these writers until <u>after</u> he had written the biological chapters of the „Ideen", as the notes to this section will show. We may add that his vitalistic „Kräfte" are not always clearly separated from the „Kraft" of the soul itself: both share the name „Kraft", and both

are imperishable, as we noticed apropos of early conservation theories. This confusion recalls that which is likewise inherent in the animistic doctrines of Stahl, that pioneer of modern vitalism, who expounded his theories in 1737.[38)]

Thus, a vigorous tradition of vitalism had existed in biology since antiquity; it attained new vigour in Herder's century, and culminated in the biological „Naturphilosophie" of the Romantics. Even Goethe speaks of „geistige Anastomose" and „geistige Kräfte" in his „Metamorphose der Pflanzen", as Nordenskiöld observes.[39)]

Having now examined nearly all of Herder's vitalistic theories, we are in a position to evaluate the words of other critics. Hansen declares:[40)]

> Wie viel schärfer sind die Vorstellungen Herders von Kräfte=wirkungen, wie der damals verbreitete dumpfe Glaube an eine Lebenskraft, wie fein seine Kritik der Begriffe!

Another critic, Rüdiger, even claims, in 1948, that Herder's vitalism is in keeping with <u>modern</u> science:[41)]

> Die moderne Biologie, insbesondere der Vitalismus, hat sich nach dem Scheitern der materialistischen Naturbetrachtung - man möchte meinen: wohl oder übel zu der bei Herder vorgebildeten Anschauung bekehren müssen --- Die Annahme von wirkenden Naturkräften ist unumgänglich, auch wenn wir sie nicht sehen.

Let us first ask whether Herder's vitalism was in advance of the biology of his own age, as Hansen claims, and then proceed to compare it with modern vitalism, as Rüdiger does. It will be of help if we bear in mind the distinction which a modern historian of physiology draws between two types of vitalism - descriptive and explanatory.[42)] The latter sort introduces unknown vital agencies of a non-physico-chemical kind, whereas the former,

more modern vitalism maintains that "the doctrine of the vital principle should be recognised as simply descriptive" (i.e. of observed events), and that "the question of whether the mechanisms behind these activities involve unique substances, or forces, or agencies --- is quite a different one."[43] This problem, we may recall, is exactly parallel to that of "relational" and "explanatory" uses of "force" in physics.

Herder, as we have seen, had multiplied his vitalistic unknowns, and attempted, on various occasions, to reduce them to specific agencies, whose properties (for example his "ether" and "elemental fire") were more than simply physico-chemical. But earlier thinkers, such as C.F. Wolff, had been content with only one such unknown (the "vis essentialis", in this case). The vitalistic theory of Blumenbach appeared in his „Über den Bildungstrieb" as early as 1781.[44] Herder wrote to Knebel in 1784, requesting a copy of this work, and received it two days later.[45] This was before he wrote his chapter on embryology and growth for the „Ideen", Part II, in which he shows signs of favouring only one vitalistic unknown, as in Blumenbach's and Wolff's theories, but it was too late to remedy that proliferation of unknowns we meet in the „Ideen", Part I. However, Blumenbach's "nisus formativus" or „Bildungstrieb" is recognisable only by its effects.[46] Its cause and nature are unknown, and Blumenbach compares it with gravitational force.[47] He thus uses it only descriptively or relationally, and makes no attempt to define its inner nature, as Herder had repeatedly done with his „Kräfte" in Part I of the „Ideen". (At other times, as we know, he says that the nature of „Kraft" is unknowable; but this should not be taken too seriously, since it was a commonplace of the age, and conflicts with his own practice.) But even before he wrote Part I of the „Ideen", Herder had met and used Haller's three physiological „Kräfte", which Haller, like Blumenbach, had

used only to describe observed natural functions.

Thus, Herder's confused vitalism was not scientifically modern even by the standards of his own age. It is more often explanatory than descriptive, and the equivalent theories of Haller and Blumenbach have far more relation to empirical observation than his does. Similarly, we noticed that Boscovich's "relational" conception of physical force was scientifically superior to Herder's qualitative physical „Kraft".

The last great exponent of vitalism in modern times was Hans Driesch, whose "History and Theory of Vitalism" first appeared in English in 1914. He was an opponent of Darwinism,[48] we may observe, and had no misgivings about citing Plotinus and Leibniz in support of his views on modern biology;[49] he wrote works on telepathy in his later years. Such a thinker was scarcely typical of scientists even in his own age. However, even Driesch's ideas are free from most of the confusion we find in Herder's, for he does not multiply unknowns, or attempt to reduce them in turn to imperfectly known physical or chemical forces or subtle and elusive substances, or personify them, as Herder does. His vitalism is descriptive compared with Herder's explanatory system.

We therefore conclude that the claims of Hansen and Rüdiger concerning Herder's vitalism are without foundation, and now proceed to ask what the philosophical implications of vitalism are in relation to present-day theories of science.

As Dessoir observes in his history of psychology, the conception of "life" is merely an abstraction from actual, observed processes, such as nutrition, growth, reproduction, etc.[50] But used in an explanatory sense, as in Herder's personifications of natural (including biological) agencies which we noticed in our introductory chapter, and in his attempts to reduce

vital „Kräfte" (at other times said to be irreducible) to physical and pseudo-chemical "forces" and substances, "life" takes on a reality of its own, quite apart from actual observed phenomena. Such vitalism simply explains ignotum per ignotius, as Bertalanffy remarks.[51] They cannot be compared with modern biochemical reductions, since the "chemical" agents Herder names are more often qualitative than quantitative, and the science of biochemistry was virtually non-existent in his day. Bertalanffy points out that this kind of vitalism is emotional rather than intellectual in origin, that it bars the way to scientific progress, and that it "means nothing less than a renunciation of a scientific explanation of biological data."[52]

However, we must not confuse vitalism, which declares that an unknown agency is really and objectively at work within organisms, with the Kantian doctrine, based on Kant's analysis of the subjective limitations of the human reason, that we can never know the „Ding an sich". In fact, this Kantian thesis is comparable only with descriptive vitalism, whereas fully fledged vitalism always falls back ultimately upon explanation in terms of various mysterious agencies, usually of a semi-spiritual kind. As Bertalanffy says in another of his works:[53]

> The history of biology is the refutation of vitalism, for it shows that always it was just those phenomena which appeared inexplicable at the time that seemed the domain of vitalistic factors.

c) Mechanism, vitalism and organicism.

In our chapter on physical science, we discovered that Herder sets up a "dynamistic" picture of the physical world in opposition to the "mechanistic" one. We now encounter the parallel antithesis between "vitalistic" and

"mechanistic" theories of life; Herder, of course, supports the former.

In biological contexts, the word "mechanism" has two principal meanings. Firstly, it can mean that the phenomena of life can be explained, at least in principle, by the universal causal laws of physical science alone, without any special factors such as hyper-physical "forces" or (anthropocentric) teleology. Secondly, it can involve the more specific theory that the living organism should be treated as closely analogous to the machine.[54] Let us discuss the first of these connotations now, before dealing with the machine analogy.

We have already examined the problem of teleology in relation to biological theory. Therefore it only remains for us to consider Herder's opinion of mechanistic theories in contrast to his belief in vitalism.

Driesch, the greatest modern exponent of vitalism, uses vitalism <u>in conjunction with</u> mechanism, as Bertalanffy points out. Bertalanffy even says:[55]

> The defect of mechanism is that it cannot do without elements of vitalism, and vice verse.

This applies to Herder too. Schütze says that Herder advocates "the organic unity of soul and machine".[56] If we do not interpret this loose use of the word "machine" (which we shall examine later) too narrowly, we can agree with Schütze's proposition. For Herder introduces his vitalistic "forces" by which the soul manifests itself (and, for that matter, his teleological arguments) <u>alongside</u> causal explanations of life. In fact, it is exceedingly difficult to say where the one begins and the other ends, for his theories of animal heat, electricity, etc. can usually be construed <u>either</u> as groping attempts to define life, in principle, by physical or naturalistic criteria, or as a means of introducing traditional vitalism

under more novel guises. It is characteristic of Herder that his ideas can often be interpreted in two distinct ways, and it would be wrong to insist on only one interpretation to the exclusion of the other. Bertalanffy describes the age-old conflict in terms too clear-cut to apply without qualification to Herder:[57]

> The real difference is one between scientific explanation and anthropomorphic "understanding".

For in Herder's scientific thought as a whole, we have seen that both modes of explanation are present, although our study of his vitalistic "forces" has shown that, in his biological theories, vitalism usually takes precedence over mechanism.

The second major use of "mechanism" in biology is found in the analogy between the organism and the machine, first consistently formulated in the modern era by Descartes. As Bertalanffy says, this analogy well expresses the feelings "of an epoch which, proud of its technological mastery of inanimate nature, also regarded living beings as machines",[58] for Descartes lived in the Golden Age of mechanics. Now we have seen that Herder categorically denied that mechanics can explain all phenomena even in the physical world (as in his ideas on gravitation, etc.). It is not therefore surprising that he execrated the machine model of the organism, which was still current in his day, especially with the French school of materialists whose intellectual progenitor was Descartes. Thus, in 1769, he exclaims:[59]

> O Mensch, die grausam vornehme Naturlehre ist nicht immer gewesen, daß die Thiere nichts als Empfindungslose Maschienen [sind].

In fact, it was primarily as a reaction against the machine analogy, not

against causal explanation in itself, that he adopted a vitalistic theory of life. He rightly believed - and his belief was emotional - that the machine analogy is an over-simplification, and he frequently rejected it as inadequate, especially in the „Ideen".[60] Lehwalder realises[61] that he impugned the claim of mechanics (as used by Hobbes, Descartes, and others) to explain psychological processes, rejecting it in his psychology essay of 1778 with equal vehemence.[62] C.F. Wolff had already explicitly dismissed the machine analogy before Herder,[63] but Herder did not read his work until he was preparing Part II of the „Ideen". However, all vitalistic theories, by implication at least, repudiate the unmediated use of mechanics in biology.

The machine analogy as an interpretation of life is indeed inadequate. Newtonian mechanics alone were not enough to explain the phenomena of life, for, although the attempt was scientifically correct in principle, it was premature and grossly over-simplified in Herder's day, since it ignored many of the complex and distinctive processes by which we recognise life. This is what even the materialist Engels means when he says:[64]

> Motion is not merely change of place; in fields higher than mechanics it is also change of quality.

The word "quality" here should not be understood in the non-scientific sense of "intrinsic nature". It simply means that life, for example, is different from inanimate substance in some fundamental way, ultimately in the enormously greater complexity of the physical and chemical processes which take place within the organism. The laws of motion are indeed basic for all branches of science, as Whitehead remarks,[65] but the machine analogy in biology assumes that they alone are enough to explain without mediation everything with which science is concerned, that is, the entire observable universe, including life and mind.

But the machine analogy is more than this. As we earlier noticed, it fails to eliminate teleology, since every machine requires a designer. (This was why the school of Descartes long adhered to a deistic theology.) If, using this analogy, we do not accept traditional teleology, we are thrown back upon an immanent one, which, in biology, always assumes the form of vitalism. Thus, as Bertalanffy observes:[66)]

> If we begin with the machine analogy, we shall wander eternally between the two poles of vitalism and mechanism. We must therefore avoid this fiction and begin with a plain statement of the actual biological data for whose explanation a theory is to be sought.

Herder's vitalism thus had some merit as an antidote to the crude and inadequate machine analogy, then still rampant in biology, especially in France. With scientific knowledge as it then was, Lamettrie and others had grossly to over-simplify their biological theories in order to maintain the consistent materialism in which they believed. However, Herder's vitalism was too near the opposite extreme, and even prejudiced the principle of natural causation itself, and led directly to a speculative metaphysics of „Kräfte".

Finally, we may recall that those of Herder's ideas which resemble what are now called the theories of "organicism" and of "levels of organisation" present a much more acceptable alternative to both mechanism (in the sense of biological "mechanics") and vitalism. We have seen, however, that he failed, in biology as elsewhere, to emancipate himself finally from his „Kräfte", despite these more auspicious steps towards a formal rather than a qualitative demarcation of animate and inanimate. As in his theory of physical science, his „Kräfte" are the greatest weakness in his ideas concerning the nature of the biological world and the ultimate definition of life.

2. Ontogeny.

In this section, we shall discuss Herder's ideas on the generation and growth of the individual organism.

a) Embryology.

Three earlier versions of Chapter IV, Book VII, of the „Ideen", Part II, the chapter in which Herder deals most fully with embryology, survive among his manuscripts.[67] This shows how great his interest in the subject was, as well as how unsettled his ideas on it were, at the time when he wrote his masterpiece. He also expresses opinions on embryology on many other occasions in his works, and we shall try to take them all into consideration in the present section.

As we noticed in relation to dialectics and theories of natural law, Herder often maintains that processes of development are produced by a dialectical conflict between two, or sometimes several „Kräfte". Accordingly, he adopted Kant's theory that the stars and planets are formed by the conflict of two gravitational forces. Similarly, it is through the resistance offered by the many „Kräfte" of the external world to the „Kraft" within our body, a resistance which the child first experiences through its sense of touch, that our mind, by means of the senses, first begins to develop, as Irmscher points out. Irmscher writes:[68]

> Unter diesem Aspekt ist der menschliche Leib sozusagen die Grenze, bis zu der die Kraft der Seele sich gegen die zudringenden Kräfte des Universums zu behaupten vermag, innerhalb deren sie noch ganz bei sich selbst ist. Jenseits dieser Grenze beginnt für sie mit der Erfahrung des Widerstandes die Welt der Objekte.

In both the cases we have cited, those of astronomical and psychological processes of development, one „Kraft" attracts to itself, or assimilates, elements from its environment; hence the stars and planets grow by the gradual accretion of matter, and the mind develops by accumulating tactile sensations of the objective world. But Herder also applies the latter (psychological) principle on a biological level. The body itself is formed by the „Kraft" of the soul, which assimilates and organises the raw materials constituting the body by means of contact or conflict with the „Kräfte" it encounters in its environment. He says of the body, in a passage already quoted and also cited by Irmscher,[69] from the early sketches (c. 1769) for the „Plastik":[70]

> Er [i.e. der Leib] ist also von ihr [i.e. der Seele] durch eine Art von fühlbarer Anziehung gebildet.

As we earlier pointed out, a basic „Kraft" („Seele"), a process of assimilation („Anziehung") and a (sensory) contact with the environment („fühlbar") are all essential elements in Herder's dialectical theory of growth. But he continues the above sentence as follows:[71]

> --- diese Attraktion ist aber noch völlig zu berechnen, so wie das Fühlbare in ihr aus der Bildung des Fötus noch zu experimentiren.

Irmscher, who examines only the astronomical and psychological applications of this theory, does not quote this final passage; but it is of especial importance for our purposes, because it shows that Herder's psychological theory of development by touch is paralleled, on a more basic, biological level, by an <u>embryological</u> conception of growth through dialectical conflict or opposition. (The other levels on which dialectical relationships of the

same kind recur in Herder's thought are listed in our section on dialectics.)

Now we observed while studying the problem of dialectics that Herder encountered a dialectical theory of embryology early in his Riga period: this was the theory of John Turberville Needham, from whose works Herder had excerpted the following words in 1765:[72]

> eine vegetativische Kraft sey der Grund aller Erzeugung: diese befindet sich in jedem Mikroscopischen Punkt und ist aus der sich ausdehnenden und wiederstehenden [sic] zusammengesezt. Sie besteht aus Ausdehnung; diese haben Thiere und Pflanzen, indeß ist im Aether auch eine wiederstehende Kraft, sonst würden sie ins unendliche zerstieben.

But Needham applied this theory to generation and growth of <u>all</u> kinds: as Herder later notes:[73]

> Needham beweist nur, daß es hervorbringende Kräfte gebe.

But it could easily be applied to animal embryology in particular. In fact, we can explain how Herder came to apply the dialectical principle to embryology simply by postulating the direct influence of Needham, without having to suggest that he did it by extrapolating either from Kant's dialectical cosmogony or from his own (and Berkeley's) theory of psychological development by touch. No doubt when he read the work of C.F. Wolff in 1784 he regarded it as confirmation of Needham's theory. For Wolff, although he contemptuously dismissed Needham's work as „ein unerträglich confuses Buch",[74] was undoubtedly influenced by it himself. He merely applied Needham's dialectical theory in a more specific manner, saying that growth takes place by assimilation, expansion and resistance:[75]

> Es ist daher die wesentliche Kraft mit der Erstarrungsfähigkeit des Nährsaftes [not the vague „wiederstehende Kraft im Aether"

> which Herder encountered in Needham's work] ein hinreichendes Prinzip jeder Entwicklung sowohl bei Pflanzen, als auch bei Thieren.

Similarly Treviranus, early in the nineteenth century, said that an expanding inner force is resisted by the rigidity of the (material) organic body it builds up around itself:[76)]

> The organ is a restriction, not the cause, of the activity of the formative impulse.

In Part I of the „Ideen", Herder still adheres to the theory that embryological growth takes place by dialectical conflict. But, just as he defines the "type" and the organism, in the same work, as composed of many „Kräfte", he is now no longer sure whether only one „Kraft" (as in his earlier idea that the one „Seele" constructs its body), or perhaps several, may be responsible for the growing embryo's inner expansion. Accordingly, he says of development in the bird's egg:[77)]

> Die organische Kraft muß zerrütten, in dem sie ordnet: sie zieht Theile zusammen und treibt sie auseinander; ja es scheint, als ob mehrere Kräfte im Wettstreit wären und zuerst eine Mißgeburt bilden wollten, bis sie in ihr Gleichgewicht treten und das Geschöpf das wird, was es seiner Gattung nach seyn soll.

On the whole, he abides in the „Ideen" by the conception that only one „Kraft" within the embryo, opposed from without by various environmental „Kräfte", provides the inward pole in the dialectical conflict of growth. Nonetheless, this one ruling „Kraft" may assimilate and govern other lesser „Kräfte" which it draws into the embryo from outside („--- sie, die über tausend Kräfte, die sie anzog, in dieser Organisation herrschte"[78)]). As we

have seen, however, he does fall back, on one occasion in the „Ideen", upon the notion of a single, purely teleological „Kraft":[79]

> Sie --- muß --- den Typus ihrer Erscheinung in ihr selbst haben.

In this statement, he has abandoned the less teleological idea of growth by dialectical conflict, and even declares, in a truly Platonic vein:[80]

> Das neue Geschöpf ist nichts als eine wirklich gewordene Idee der schaffenden Natur, die immer nur thätig denket.

However, it is the influence of Harvey, whose classic work on embryology Herder read in the 1780's, which has here supplanted the dialectical theory of Needham in his mind. Herder himself had noted while preparing his „Ideen":[81]

> Harvei [sic] nimmt impressio idealis an, wie im Kopf des Künstlers.

This is clearly the source for his surprisingly teleological statement quoted above. But O. Temkin, in the article to which we have already had occasion to refer, overemphasises this teleological or Platonic element in Herder's writings on ontogeny, and does not mention that it is only one among several different interpretations of embryological development which Herder puts forward at various times.

We have now discussed Herder's earlier and more general views on embryology. Let us next evaluate his more specific ideas on the subject, especially as they appear in the „Ideen".

Embryology was still a very imperfectly developed subject, largely given over to speculation, in Herder's age. Herder himself realises the prevailing lack of knowledge, and says in 1783 of the human embryo in particular:[82]

> Die Art der Bildung des Menschen im Mutterleibe war den Morgenländern das unerforschbarste Wunder, das tiefste Räthsel; und ist sie es nicht allen Naturweisen noch bis auf diese Stunde?

Like many of his contemporaries, he used the idea of „Kräfte" in embryology, as in so many other areas of his thought, to make up for the prevailing lack of exact knowledge. Having discussed the dialectical conception of embryological „Kräfte", we shall now examine the other applications of vitalistic „Kräfte" in Herder's writings on the subject, and in eighteenth century embryology in general. This brings us first of all to that great controversy between "epigeneticists" and "preformationists".

Many modern writers, including Driesch, the historian of vitalism, have assumed that the theory of epigenesis, which maintained that the embryo develops by acquiring its parts and its characteristic conformation successively, is always coupled with vitalism, whereas vitalism and preformationism are seen as incompatible. Joseph Needham, in his history of embryology, has shown, however, that the connection between epigenesis and vitalism is by no means necessary.[83] Now Herder, as we know, held vitalistic opinions in biology from his earliest period as a thinker. Nonetheless, his first utterances upon the epigenesis-preformation question seem to indicate that he favoured the hypothesis of preformation, also known as the "capsule", "emboîtement" or "evolution" theory (i.e. the theory that the embryo develops only by expanding, and that the parts and conformation of the adult organism are present in miniature, preformed or predelineated, from the time of generation, and that the earliest members of every species contain all future members, in the form of microscopic "seeds", within them). He writes in 1768, in his „Fragmente":[84]

> In dem Saamenkorn liegt die Pflanze mit ihren Theilen; im Saamenthier das Geschöpf mit allen Gliedern.

In the language essay of 1770, he again writes:[85]

--- ist also nicht im Keime der ganze Baum enthalten?

And in a sermon of 1773, he speaks of the initial state „wo der Baum im Keime und tausend Keime in Einem und die ganze Schöpfung in Einem Keime liegt, und nur auf stille Entwicklung wartet."[86] However, this last statement obviously refers not just to embryology, but to development in general; it is probably only a renewed affirmation of that "genetic method" which Herder cultivated in his earlier years. But just as he abandoned his early notion that, by the "genetic method", we can discover or predict all subsequent developments simply by studying the origin of a phenomenon, and decided instead that the successive sequence of development itself must be studied in all its stages (in accordance with the so-called „Entwicklungsgedanke"), he soon gave up his early allegiance to a loosely "preformationist" conception of embryology, and, as we shall see, eventually came to accept the main teachings of the rival epigenetic school. Perhaps he also realised that preformationism was incompatible with that dialectical theory of successive growth which he had borrowed from Needham and Kant. However, his early combination of general vitalism and a loose preformationism shows that, as Joseph Needham maintains, the two ideas need not be mutually exclusive.

It appears then that Herder, in his earlier years, used both vitalism and preformationism, just as Bonnet did. But, at this time, he had not yet studied biology, or embryology, in any detail. He seems to have known of the preformation hypothesis, and used it as a metaphor for describing his "genetic method". But as soon as he had begun, in the 1770's, to study physiology and biology in detail in the works of Haller and others, he found Bonnet's theory of preformation inadequate. For example, in the „Älteste

Urkunde" in 1776, he scathingly rejects the idea of a „Limbus präformirter Seelen"[87] - presumably it is Bonnet whom he here has in mind. Already in the 1774 version of his essay on psychology, he had rejected the theory of preformed „Keime" as „mechanisch":[88]

> Die Mechanische Philosophie betrachtet die Natur als abgestorben, todt, die blos aus alten, abgelebten Keimen würke.

And in the „Ideen", he says:[89]

> Die Theorie der Keime --- erklärt eigentlich nichts: denn der Keim ist schon ein Gebilde und wo dieses ist, muß eine organische Kraft seyn, die es bildet. Im ersten Saamenkorn der Schöpfung hat kein Zergliederer alle künftige Keime entdeckt ---

Later in the same work, he again repudiates the preformation hypothesis,[90] having explicitly named Bonnet a few pages earlier[91] as the source of this untenable theory.

However, Rouché[92] and Pamp[93] both quote a surprising sentence in which Herder goes on to reject not only preformation, but epigenesis as well:[94]

> --- so, dünkt mich, spricht man uneigentlich, wenn man von Keimen, die nur entwickelt würden, oder von einer Epigenesis redet, nach der die Glieder von außen zuwüchsen. Bildung (genesis) ists, eine Wirkung innerer Kräfte, denen die Natur eine Masse vorbereitet hatte, die sie sich zubilden, in der sie sich sichtbar machen sollten.

In an earlier version of the „Ideen", he even speaks of „die sinnlose Epigenese".[95]

It is clear from these words that he is, as usual, more interested in his qualitative, vitalistic „Kraft" in embryology, than in the formal patterns of development which were described in both the preformation and

epigenesis theories. As we earlier noticed, even the more formal dialectical theory of growth becomes confused in the „Ideen", and Herder introduces a teleological, even Platonic theory later in the same work. This becomes specially evident in Part II of the „Ideen", where a whole chapter is devoted to the vitalistic theory of growth (which is treated in turn in relation to the environmental determinants which act from outside upon the organism).

At the beginning of the chapter in question, the development of the animal embryo is described in concrete detail. Temkin quotes the following words from this passage:[96)]

> Aus Kügelchen, zwischen welche Säfte schießen, wird ein lebender Punkt --- das Herz erzeuge sich nicht anders, als durch eine Zusammenströmung der Kanäle, die schon vor ihm da waren ---

Temkin says that these notions seem to be derived from C.F. Wolff. This is quite correct, for Wolff writes in his "Theoria generationis":[97)]

> Die Nährsäfte bewegen sich, durch diese Kraft [i.e. Wolff's "vis essentialis"] getrieben, durch jene aus Kügelchen gebildete Substanz hindurch, lagern sich zwischen diesen Kügelchen ab, und vermehren auf diese Art das Volumen des Embryos ---

Besides, in declaring that the heart is formed successively from „Kanäle" which gradually converge, Herder is employing in practice the very epigenesis he had rejected in theory, along with preformation, in Part I of the same work.

The reason for this change is that Herder, since writing Part I of the „Ideen", had read three works on embryology, each of which put forward a theory of embryological growth, classifiable both as vitalistic and epigenetic: these were Harvey's "Exercitationes de generatione animalium" (1651), Blumenbach's „Über den Bildungstrieb" (1781)[98)] and C.F. Wolff's

"Theoria generationis" (1759, 1764 and 1774)[99].

But before we proceed further, we must digress in order to examine how Herder came to know the work of C.F. Wolff, since critics have hitherto failed to agree on this important question.

Firstly, we can dismiss as completely unfounded the following words of Clark:[100]

--- I find no evidence that Herder ever read Caspar Friedrich Wolff.

On the contrary, Herder refers to Wolff on four occasions in the „Ideen", even mentioning him twice in Part I.[101] Three of these references are to Wolff's principal work, the "Theoria generationis". Furthermore, Suphan, in his edition of Herder's „Ideen", says that a long extract from this work appears in Herder's notebooks.[102]

Other critics, however, have realised that Herder did read Wolff's work; but they disagree over several chronological details. The controversy dates from Haym's assertion:[103]

> Durch Herder ist Goethe mit K.F. Wolffs theoria generationis bekannt gemacht worden.

Now Hansen, in his well known work on Goethe's „Metamorphose der Pflanzen" notes that Goethe himself said that F.A. Wolf drew his attention to C.F. Wolff's work after 1790 for the first time.[104] The question of date is an important one, because Wolff's ideas have significant similarities with Goethe's theory of plant metamorphosis, yet Goethe claims that he did not meet Wolff's writings until after he had composed his own work. Hansen accepts Goethe's word, and is therefore compelled to disagree with Haym.[105] But Haym quotes two letters from Herder to Knebel, and gives them the dates of 15th and 19th December, 1784, although they were published in „Knebels

Literarischer Nachlaß" without dates. In these letters, Herder asks Knebel to procure the work of Wolff, which Herder intends to give to Goethe as a present. Hansen, who is aware that the letters were published without dates, concludes that Haym's dates can only be arbitrary, and declares:[106]

> Ich halte diese ganze Verschiebung der Geschichte für sehr mangelhaft begründet.

But Hansen, who is bent upon minimising Goethe's debt to others, is not justified in doubting Haym's scholarly integrity. For the letters written by Knebel in reply to Herder's are printed by Düntzer, with dates from Knebel's original manuscripts (because Düntzer always brackets conjectural dates, and these are not in parentheses), in the collection of letters „Von und an Herder". In a footnote, Düntzer refers to the two letters from Herder, whose dates, as given by Haym, Hansen has questioned, and dates them just as Haym does; for although Herder had not dated them himself, the known discrepancies between the dates of Knebel's letters and the time of postal deliveries in Weimar from Jena provide the dates of Herder's letters with tolerable accuracy, and Düntzer undoubtedly used this method of dating them. Thus, Haym had quite correctly cited the dates given by Düntzer, whose work Hansen apparently omitted to consult, or of whose existence he was perhaps unaware.

Suphan, in his edition of the „Ideen", unfortunately accepts the word of Hansen, not that of Haym, and also adds that Goethe first obtained a copy of Wolff's work from Loder at a later date.[107] But Gillies[108] and Harich,[109] no doubt following Haym, declare that Goethe came to know the work of Wolff through Herder.

The true sequence of events was, in fact, as follows. (Exact sources

are given in the notes to each statement.) Herder writes to Knebel on or around the 15th December, 1784, asking for Wolff's „Theorie der Generation" [sic] among other works on biology.[110] Knebel replies on 17th December, 1784, apparently sending the Latin edition of Wolff with the other works.[111] (Since, in this letter, Knebel says that he looks forward to Part II „Ihres trefflichen Buchs", i.e. of the „Ideen", we have added proof that these letters date from late in 1784, not from after 1790, as Hansen claims.) Herder replies on or around the 19th December, 1784, saying that he has in the meantime read the Latin version of Wolff, but now wishes to obtain the German edition of 1764.[112] Knebel writes back on 28th December, 1784, saying that he is trying to obtain this edition.[113] Shortly afterwards, in a letter given the conjectural but erroneous dating "1795?" by the editors of „Knebels Literarischer Nachlaß", Herder renews his request, and says that he intends to make a present of the German edition of Wolff's work to Goethe, to whom he is also about to show his newly finished chapter on embryology for the „Ideen", Part II.[114] However, Knebel replies on 7th January, 1785, announcing that he has finally failed to obtain a copy of the required edition.[115]

All this, along with the references to Wolff's work in the „Ideen", shows that Herder read the work, in the Latin edition, in the winter of 1784-85, contrary to what Hansen says. But have we any proof that he showed this edition to Goethe at this time? The chances are that, having failed to obtain the German one, he did. As Clark, who wrongly believes that even Herder had not read Wolff, declares:

> We can be sure that, had Herder known Wolff's work in the 1770's or 1780's, he would have directed Goethe's attention to it at the time of their biological discussions in 1783 or 1784.

Besides, Herder tells Knebel that he is about to show Goethe his chapter on embryology for the „Ideen", in which he twice refers to Wolff. And Wolff is mentioned even in Part I of the „Ideen", as we earlier remarked. Goethe undoubtedly read the complete „Ideen", the greatest work of Herder, his closest friend in those years, thus he must have encountered at least some of Wolff's ideas at that time, if only through the mediation of Herder's own theories.

But how could Herder refer in Part I of the „Ideen" to the work of Wolff which, as we know from his letters, he read only while preparing Part II?

The great opponent of the epigeneticist Wolff was the preformationist Haller. Herder read Haller's writings in the early 1770's, and often refers, at that time, to his great work on physiology, especially to Volume 8, which deals with embryology and reproduction. Now Haller, in this volume, describes, discusses and criticises the ideas of Wolff, his subsequently successful opponent, in considerable detail.[116] Besides, we know that Herder came to reject preformation at the very time when he was reading and quoting from the preformationist Haller, and early gave preference to a vitalistic theory of embryology. It is therefore probable that he acquired some knowledge and appreciation of Wolff's ideas from Haller's work. This would explain why he could mention Wolff in Part I of the „Ideen", before reading his "Theoria" himself. It also seems probable that Goethe encountered some of Wolff's ideas before he wrote his „Metamorphose der Pflanzen", even if he did not read the work, and the more particularly botanical theories expounded in it, until later. But since it is not our task to discuss in detail the influence of Wolff on Goethe, we may now return to Herder's ideas on embryology.

In Part II of the „Ideen", as we have seen, Herder ended up by employing in practice the very epigenesis, with its doctrine of successive growth by convergence upon a centre, which he had rejected in theory in Part I before reading Harvey, Blumenbach and Wolff. It was, of course, inevitable that he should accept epigenesis to some degree, since it accorded with his old belief in successive dialectical development, whereas the preformation hypothesis is basically static.[117] This is why he had already rejected preformationism in the 1770's. Indeed, he may also have rejected it because it fails to explain the phenomenon of regeneration, which, as we noticed in our section on classification, he used as a means of distinguishing between lower and higher forms of life. Appeals to the regeneration of lost animal parts were one of the most telling arguments ever advanced against preformationism,[118] although Herder never uses this argument explicitly.

However, Clark says that Herder never accepted epigenesis fully either, because of the "extreme environmentalism" associated with it, and that he accepted preformationism in so far as it taught that developments take place from <u>within</u>.[119] But most epigeneticists believed in inner, more or less teleologically controlled developments rather than in environmentally determined ones, as Temkin points out.[120] We have also seen that the pronouncedly teleological, even Platonic element in Herder's embryological chapter in the „Ideen" can be explained by the influence of Harvey, who, as Nordenskiöld observes, was himself an early supporter of epigenesis.[121] Thus epigenesis, as well as preformation, could describe developments from within, without any reference to environment. Clark was doubtless misled by the title of the chapter from the „Ideen" under discussion. It is:[122]

> Die genetische Kraft ist die Mutter aller Bildungen auf der Erde, der das Klima feindlich oder freundlich nur zuwirket.

Herder believes, in fact, as we shall see, that the same „Kraft" which governs the formation and growth of the embryo later continues to sustain the organism after its birth. But only then does the question of environmental determinism become relevant. The theories of preformation and epigenesis, however, both accounted only for embryological development in the strictest sense - i.e. for the growth of the unborn embryo, whose environment is the parent organism, not Herder's external „Klima". Thus, Clark's statement that the epigenetic theory involved the doctrine of "extreme environmentalism" has no relation to the actual theory of epigenesis, which concerned only embryology.

We may conclude, therefore, that Herder came to accept epigenesis in practice, introducing strong teleological overtones, in Part II of the „Ideen". Previously, in Part I of the same work, he had been unwilling to commit himself either to preformation or to epigenesis, and had rejected both in favour of a general and unspecific vitalistic theory. He had also, especially in earlier years, used the dialectical theory of Needham (which was itself really epigenetic), and had even toyed with the preformation hypothesis, in a general way, in his first pronouncements on embryology. His approach was therefore typically vague and eclectic throughout.

Before we leave this question, we must devote some attention to sources. Both preformation and epigenesis had religious affiliations (corresponding respectively to the doctrines of simultaneous and successive creation), as Clark points out.[123] We may add that the „Limbus präformirter Seelen" which Herder rejected in the 1770's does indeed suggest a theological source; in fact, it recalls the doctrine of traducianism, found in some of the Patristic writings, which declared that all souls were created at the earth's creation.[124] However, the latter doctrine involves a subsequent transmigration of the original souls rather than the emergence of new ones from

preformed "germs", as in the preformation theory. But, as one historian of theology and science shows,[125] the doctrine may well have been suggested by Hebrews, 7, 10:

> For he was yet in the loins of his father, when Melchidesec met him.

But although preformation and epigenesis both had theological equivalents or sources, we need not assume that Herder, in using either of them, was applying theology to science. These two theories were the principal ones current in Herder's day in embryology, and it was in the writings of earlier scientists, not theologians, that Herder encountered them. For preformation had been taught by Swammerdam, Malpighi, Bonnet, Haller, Spallanzani, Hartsoeker and others.[126] Herder himself had encountered it chiefly in the writings of Bonnet and Haller, and, in a less specifically embryological form, in Kant's theory, already mentioned, that racial changes are brought about when climatic influences evoke certain preformed "germs" of potential racial differentiation which are present in all men since the creation of man. (In his „Kritik der Urteilskraft", however, Kant supported Blumenbach's epigenetic theory in the narrower field of embryology.[127]) As for epigenesis, it had been supported by Harvey,[128] Descartes, Maupertuis,[129] Needham, Wolff and Blumenbach,[130] among others. Herder had met the theory, as we have seen, chiefly in the works of Harvey, Blumenbach and Wolff, although he had early encountered the less specific theory of Needham, and perhaps also Maupertuis' non-vitalistic version, which does not seem, however, to have influenced him, probably because it was too mechanistic.

Finally, we may note that Herder, in supporting epigenesis, was following the most progressive current of embryological thought in his age, but that his own vitalistic theory, unlike the qualified vitalism of Blumenbach and

even of Wolff, was too unspecific to be of much value as a working hypothesis. Truly scientific embryology arose only in the following century, with the exact studies of W. Roux,[131] and a priori speculations were finally banished. Joseph Needham, in his history of embryology, neatly sums up the modern position in relation to eighteenth century ideas:[132]

> Whitman distinguished between Predetermination, a physiological or potential preformation not capable of microscopic resolution, and Predelineation, which is the old morphological or visible preformation. Modern embryology might therefore be called Predetermined Epigenesis.

A few concluding remarks may cover some remaining questions in embryology. Ovism and animalculism, the two rival theories which maintained respectively that the embryonic organism originates from the female and from the male parent, play no part in our discussion, since they were usually associated with preformationism, which Herder never advocated in detail, and since he himself never mentions them. Nor does Buffon's curious theory of "molécules organiques" and the "moule intérieur"[133] play any part in his thought; he actually derides „Löwenhöcks und Buffons Romane der Thierer=zeugung" in 1776.[134] (Leeuwenhoek, as his name should be spelt, was an "animalculist".[135]) We shall return to the question of spontaneous generation, which has some bearing on embryology, when we examine Herder's beliefs concerning the (phylogenetic) origin of life on earth.

All in all, we have seen that Herder's utterances on embryology are never sufficiently exact or detailed to do justice to the finer points of the subject. He usually contented himself with applying his own biological

vitalism, in a general way, to embryological theories which various practising scientists had already expounded.

b) Growth and regeneration of animal organs.

We noticed in our discussion of anthropomorphism that Herder compares the structure of the human organism with that of the tree. He also employs a dynamic version of this static, morphological comparison in describing growth in the „Ideen". On this latter occasion, however, the growth of the individual human organism is compared with that of the flowering plant, and, in keeping with Herder's usual belief in successive or epigenetic growth, the brain is said to develop out of, and after, the spinal cord.[136] He says of the developing brain:[137]

> So ward, wenn ich in einem Bilde reden darf, die Blume gebildet, die auf dem verlängerten Rückenmark nur empor sproßte ---

He also speaks of „das kleinere Gehirn, die sprossende Blüte des Rückens",[138] and extends the same image to describe less advanced creatures:[139]

> In Geschöpfen, bei denen das Gehirn kaum anfängt, erscheinet es noch sehr einfach: es ist wie eine Knospe oder ein paar Knospen des fortsprießenden Rückenmarkes, die nur den nöthigsten Sinnen Nerven ertheilen.

In this last sentence especially, the archaic notion that the brain, situated at the highest point of the body, is the most refined product of the upward-striving creative force (which is in turn related to the idea that the juices of a plant become more refined with sublimation, finally producing the flower), is combined with the correct embryological observation that the brain sends out nerve-connections, as it grows, so as to establish links with the various senses.

The notion that the brain is simply an extension of the spinal medulla reminds us of a comparable and better known theory put forward some years later by Goethe and first mentioned by him in a letter to Herder from Venice:[140] it is the so-called „Wirbeltheorie des Schädels", the theory that the skull or cranium is simply an extension and modification of the upper few vertebrae. Goethe's theory is simply the morphological, osteological equivalent of Herder's dynamic, physiological conception of cerebral development, and it is quite conceivable that one may have influenced the other.

Herder's remarks upon the growth of the brain and the nerves bring us to another problem, that of how the nerves are distributed and how this distribution is related to the regeneration of severed organs in the animal.

On several occasions we have noted that Herder, in his „Ideen", distinguished between lower and higher organisms by supposing that a progressively more complex arrangement of constant basic elements can be observed from lower to higher forms. This now well-attested phenomenon, we saw, is known today as "progressive integration". Thus, in lower organisms, nerve-centres are more independent of each other, i.e. they are less integrated. „Jeder Nervenknote [sic]" of a lower organism, Herder declares, is „ein kleineres Gehirn".[141] In such creatures, an „organische Allmacht" prevails throughout the separate organs, and „bei einigen Thieren kommen nicht einmal die Nerven beider Augen --- zusammen."[142] He also says of the insect:[143]

> Die Seele des kleinen Kunstgeschöpfs war also in sein ganzes Wesen verbreitet.

It is this idea of greater independence of less specialised parts in lower organisms which Herder correctly uses to explain how they have greater powers of regenerating lost parts. But the term „Seele", instead even of „Kraft", reveals on this occasion the archaic roots of the idea, which

experimenters such as Spallanzani,[144] even before Herder's time, were already correlating more closely with the observed processes of regeneration. Even Aristotle had said that all parts of the organism possess some kind of "soul", although usually only a "vegetative" soul in the case of elementary creatures. ("Sentient" and "rational" souls are found only in more advanced species, and are situated only in certain more specialised areas of their bodies.[145]) Robert Whytt (1714-1766), a follower of the vitalist Stahl, had also said that the souls of all organisms pervade their entire bodies.[146] Thus, Herder's conception of regeneration lies between the older, animistic beliefs and the modern idea of "progressive integration".

Goethe takes up this notion in his essay „Fossiler Stier" of 1822:[147]

> Alle einzelnen Glieder der wildesten, rohsten völlig unge= bildeten Thiere haben eine kräftige vita propria; besonders kann man dieses von den Sinneswerkzeugen sagen: sie sind weniger abhängig vom Gehirn, sie bringen gleichsam ihr Gehirn mit sich und sind sich selbst genug.

But whereas Herder had used the idea of varying degrees of integration of the nervous system as a means of classification, and of explaining the regeneration of lost parts in extant species, Goethe (and other writers read or mentioned by Goethe) began, in the earlier part of the nineteenth century, to relate it to palaeontology and phylogeny. It was soon applied to the evolutionary series as a means of distinguishing between more primitive and more advanced organisms, and became related to the modern theory of evolution by descent.

c) The life-process of the individual organism and the effects of age.

In the chapter of the „Ideen", Part II, which contains Herder's fullest account of embryology, the vitalistic force supposedly responsible for the

growth of the foetus is called the „genetische Kraft". Herder says further of it „daß diese lebendige Kraft das ausgebildete Geschöpf nicht verlasse sondern sich in ihm thätig zu offenbaren fortfahre; zwar nicht mehr schaffend, denn es ist erschaffen, aber erhaltend, belebend, nährend."[148] As Temkin observes, the „genetische Kraft" sustains the adult organism until it weakens with age.[149] Thus, the development of the embryo and the further life-processes of the independent organism are continuous for Herder and, as on so many occasions, it is a constant „Kraft" which provides the continuity. (It is this same „Kraft" which causes the regeneration of lost parts, as described above.) Wolff likewise says of his own "vis essentialis" „daß diese Kraft --- ebenso auch im erwachsenen Menschen vorhanden ist, davon kann man sich leicht überzeugen",[150] and Blumenbach says of his "nisus formativus" that it "continues to act through the whole life of the animal, and by it the first form of the animal, or plant is not only determined, but afterwards preserved, and when deranged, is again restored."[151]

In the 1769 manuscript published by Irmscher, Herder explains the process of ageing as caused by a supposed decline in the strength of the sustaining „Kraft":[152]

> --- meine Seele kann sich nicht mehr vervollkommnen: sie kann nicht mehr im Raum und Zeit [sic] würken: ihre vitale Kraft also kann nicht mehr dem Allen entgegenwürken, was auf sie stürmt - ich sterbe.

Similarly, Haller had written of the process of ageing:[153]

> Es nimmt die angebohrne und nervige Kraft ab.

Blumenbach likewise declared later:[154]

> The activity of the nisus is in an inverse ratio to the age of the organised body.

And, around the beginning of the nineteenth century, Bichat said:[155)]

> Life is the sum total of the functions which resist death.

However, it is more likely that Herder first found his theory of ageing as a decline in the inner „Kraft" of the organism in the face of opposing „Kräfte" in the writings of Needham, since he did not know the works of the other writers named (with the possible exception of Haller) in 1769. Needham maintains that "la force expansive, qui d'abord prédominait, perd son empire peu à peu, et cède à la résistance, qui à son tour prend le dessus --- ainsi on peut dire que nous portons au-dedans de nous les principes de la vie et de la mort."[156)] But if Needham's ill-defined "résistance" were an internal force, that of the increasing rigidity of the body itself acting against the expansive life-forces which work within it, as in Wolff's version of the same theory, and not a set of external forces as in Herder's theory of 1769, Herder might be said merely to be applying Kant's theory of conflict between gravitational forces to the organism.

On the other hand, he goes on in the 1769 manuscript already cited to say that the soul itself is nonetheless immortal in man:[157)]

> Mein Tod ist nur ein Vertreiben, aus Zeit, und Raum: Keine Schwäche meiner Kraft.

This, of course, conflicts with his previous description of ageing as a decline in resistance to outside forces. But perhaps he considered the „vitale Kraft" which weakens with age as different from the transcendental „Kraft" of the soul itself, which remains unaffected by age or even by death. Yet he says in the „Ideen" of the soul:[158)]

> Lasset es seyn, --- daß sie nur als eine organische Kraft wirke; sie soll auch nicht anders würken dörfen.

And in the chapter which deals with embryology, he says of the „Lebenskraft":[159]

--- sie ermattet endlich im Alter ---

He distinguishes it at least from the higher faculties of the soul on this occasion:[160]

Das Vernunftvermögen unsrer Seele ist sie nicht.

Yet in Part I of the „Ideen" he ascribes a permanence or quasi-immortality to the purely organic „Kraft" of plants and trees, and denies „daß die Kraft, die diese Theile belebte, die vegetiren und sich so mächtig fortpflanzen konnte, mit dieser Decomposition gestorben sei."[161]

Thus, the organic „Kraft" which creates and sustains the individual organism, like the immortal soul, can never be destroyed, according to the mature Herder, although his later words „sie ermattet endlich im Alter" seem to imply that some change takes place. But he fails to make any clear distinction between the two kinds of „Kraft", for to do so would have meant reopening that dualistic gap between soul and body which the very conception of „Kraft" was designed to bridge. The same weaknesses we have observed in all his applications of the „Kraft" principle thus also render his ideas on the life-process of the individual organism obscure and unscientific.

3. Ontogeny and phylogeny.

The following words from Herder's „Ideen" have given rise to a good deal of comment:[162]

> Das Kind in [sic] Mutterleibe scheint alle Zustände durchgehen zu müssen, die einem Erdegeschöpf zukommen können. Es schwimmt im Wasser: es liegt mit offnem Munde: sein Kiefer ist groß, eh eine Lippe ihn bedecken kann, die sich nur spät bildet; so bald

> es auf die Welt kommt, schnappt es nach Luft und Saugen ist seine ungelernte erste Verrichtung.

Siegel quotes the passage,[163] as does Rouché, who asks of it:[164]

> Et ne semble-t-il pas entrevoir la célèbre loi de Haeckel sur les rapports entre l'embryogénie et la phylogénie ---?

He soon adds, however, that Herder, unlike Haeckel, does not say that the developing embryo repeats all the main stages found in the evolution of species by descent.[165] Kohlbrugge likewise declares that, although Herder supported epigenetic views on the development of the embryo, he nowhere says that this development repeats the phylogenetic evolution of life:[166]

> Epigenese und Phylogenese hatten damals noch nichts miteinander gemein.

The Marxist Reimann, however, acclaims Herder's statement as an exact anticipation of the materialist Haeckel's „biogenetisches Grundgesetz" that ontogeny repeats phylogeny.[167] And Temkin, in his excellent article on ontogenetic theories in Germany around 1800, points out that Herder considers the same „Kraft" to be responsible both for the development of the individual organism and for the successive creation of species in the history of life on earth. (Temkin no doubt thinks of Herder's creative „Äther" or „Lebenswärme", or perhaps only of the more general „organische Kräfte".) He adds:[168]

> This being the case, it was not far fetched to assume, on the basis of an identical genetic force, the existence of a parallelism between ontogenetic development and the scale [i.e. the successive scale of creation in time] of beings.

K.F. Kielmeyer, the teacher of Cuvier, drew a similar inference, saying that the main physiological functions in the growing embryo appear in a sequence

commensurate with their relative distribution in the existing scale of natural organisms; Kielmeyer was here directly influenced by Herder's „Ideen", Temkin maintains, and Schelling, following Herder and Kielmeyer, has a similar idea.[169)]

However, we shall shortly see that Herder did not believe in the evolution of species by descent, so that we can agree with Rouché, and disagree with Reimann, since Herder cannot therefore have anticipated Haeckel's purely evolutionary formula. But there is no reason why Temkin should not be correct in saying that Herder believed that the successive emergence of species in time, through other means than evolution by descent, followed the same order of phases as the growing embryo, except that Herder himself only says that the growing embryo undergoes „alle Zustände ---, die einem Erde=geschöpf zukommen können", and does <u>not</u> specifically refer to the consecutive phases in the emergence of species in time. He could easily have made this comparison, which readily suggests itself from his own premises (for he believed in the successive emergence of progressively higher species in the earth's past, as we shall see, without suggesting that they are descended from one another), but he did not do so; it was left to later writers, perhaps under his influence, to draw this conclusion.

Thus, Herder draws a parallel between temporal developments on the ontogenetic level and the static, observed differences between extant organisms on earth. But we noticed in our section on cyclic theories of change that, in his „Auch eine Philosophie", he also compares the development of all individual organisms with the cultural „Lebensalter" of human history. We have also seen that he believed that the vision of primitive peoples is parallel to that of the young child, for both see „Riesenfiguren", while the civilised or adult sense of vision, mediated by the sense of touch, reduces

objects to their correct relative sizes.[170] Indeed, it is almost a biological evolution which is here implied - i.e. the idea that man's senses have progressively developed in history. Temkin thus correctly observes that history and biology are also parallel for Herder.[171] But we noticed in our sections on holism and the "levels of organisation" that such parallels between different levels of development are usually derived rather from a priori holistic premises than directly from the data of embryology, biology, and so on (although Herder, especially in the „Ideen", reinforces them to a considerable extent with empirical evidence). He believed that parallel, dynamic wholes exist on different levels, from embryology to history; the later consequences of such basically a priori beliefs have indeed been momentous in biology, but we must beware of exaggerating the function of biology and of empirical observation in Herder's original formulations of these ideas.

The theory of which Rouché, Reimann and others name Haeckel as the originator, that ontogeny repeats phylogeny, is technically known as the "recapitulation theory". Aristotle, as Needham's history of embryology shows,[172] had already suggested a similar theory, in a concrete (but non-evolutionary) way. Only in the eighteenth century were such ideas revived on a relatively empirical basis. Needham observes that hints of the theory appear in Goethe's works, and in those of John Hunter, but he does not mention Herder. He says that it was von Baer (not Haeckel) who first formulated it,[173] and White, in his history of science and theology, shows that Darwin and Agassiz also stated it perfectly clearly, before Haeckel publicised it in Germany.[174]

But Herder himself did not arrive at his much debated statement on ontogeny out of nowhere. Bonnet had contended that, with each periodic

cataclysm of the earth, the "germs" of new living forms begin to develop, all earlier forms having been destroyed; the new "germs" produce more advanced species than those destroyed, but, as they develop, they recapitulate those phases found in the earlier, extinct organisms.[175] Dobbek also declares that Einsiedel, in the notes which Herder copied, hinted at a similar „biogenetisches Grundgesetz".[176] But the notes in question date from 1791-1796, after Herder had written his „Ideen", so it is probable that Herder, perhaps influenced by Bonnet, in turn influenced Einsiedel, rather than vice versa.

We conclude that, although we have disagreed with Temkin on some details, we can accept his contention that Herder is a notable member of a sequence of thinkers who gradually came to realise that there are significant similarities between ontogeny and phylogeny. The train of ideas to which he contributed eventually led, with new palaeontological evidence and the evolutionary theory of Darwin and others, to the now well-attested principle that ontogeny repeats phylogeny.

We shall next examine Herder's beliefs concerning phylogeny itself.

4. Phylogeny: the problem of evolution.

In this section, we shall discuss Herder's theories of the origin and development of living species, along with various associated topics. Since considerably more has been written about this than about any other division of his scientific thought, we shall in many cases confine ourselves to reviewing the results of other critics' work, particularly in dealing with the theory of evolution by descent, about which there can no longer be any major disagreement as far as Herder is concerned, largely because Rouché has

treated it so thoroughly in his authoritative work on Herder and Darwinism.[177] But we cannot ignore the problem of evolution altogether, since no account of Herder's scientific ideas would be complete without some mention of it.

We shall find that, as in most areas of Herder's scientific thought, there are two sides to his beliefs concerning the history of life on earth - a naturalistic, and a metaphysical or even religious one; these two sides, as usual, are difficult to distinguish, mainly because of his habitual and sometimes intentional vagueness. Too many critics have emphasised either the one or the other, as when certain propagandists of militant materialism, whose dogmatic and uncritical pretensions Rouché exposes so well, attempted in the later nineteenth and early twentieth centuries to portray Herder as a thorough-going Darwinist, and, conversely, when other critics (with Rouché himself not least among them) tried to show that his theories of life and its emergence are firmly based upon religious premises, even upon those of Christian orthodoxy.

But first of all, we should realise that pre-Darwinian theories of evolution by descent are not necessarily either scientific (or Darwinistic) or anti-religious. For example, Sir James Frazer, in his essay "Creation and Evolution in Primitive Cosmogonies", finds that the idea that man evolved from animal ancestors or from elementary forms of life is just as common, in the religions of primitive peoples, as the belief that man was created by a higher being.[178] Besides, as we shall see, naturalistic theories of creation by "spontaneous generation" find a certain amount of support even in the Book of Genesis, and various Christians, from the Middle Ages onwards, put forward theories of creation which included more or less evolutionary elements. For example, Franciscus Rueus, in 1566, declared that "the earth

and all that therein is was [not] brought into existence in its completed form in an instant of time, but rather --- this edict [the divine fiat] constituted 'Creation'. Some things at once appeared in their final and perfect form; others in their principles and beginnings, these to reach their completed growth as time went on through the action of secondary causes, which were also put into operation by the creative act."[179] Thus, pre-Darwinian beliefs in some form of natural evolution were not necessarily anti-religious; and conversely, those who did not support the theory of evolution by descent before Darwin's evidence gave it overwhelming support cannot be infallibly branded as men who sought to impose religious orthodoxy upon science, or as opponents of science out of theological prejudice. Their prejudices, where they existed, were just as often metaphysical as theological, and, since no clear palaeontological and genetic evidence had as yet been adduced in support of the evolutionary hypothesis, earlier theories of evolution by descent, for example those of the eighteenth century, were scientific only in a qualified sense. They were scientific only in that they extended the principle of natural causation to cover every known phenomenon, including the origin of man and of the animals on earth. But to do so they had to theorise far in advance of available empirical evidence. This meant that the average scientific thinker, in the almost complete absence of empirical evidence, was not prepared to adopt such theories, even although they were methodologically sound. Thus, declared opponents of evolutionism and non-evolutionists in general in the eighteenth century numbered not only the champions of religious orthodoxy, but also the great majority of educated men. The embittered conflict which raged in the later nineteenth century between anti-Darwinian theologians and certain militant and atheistic adherents of Darwin's ideas made the whole issue

appear much clearer-cut than it had previously been, and than it has again become within the last few decades.

Secondly, in examining the problems of the history of life on earth and the classification of existing organisms, Herder and most of his contemporaries were much less influenced by the orthodox Christian tradition than by the metaphysical doctrine of a "Chain", "Ladder" or "Scale of Being". As A.O. Lovejoy points out in his classic history of this doctrine, it is derived, like so many other conceptions common to both scientific and mystical thought, from the Platonic tradition, and ultimately from the "Timaeus" of Plato himself.[180] A. Thienemann[181] and Basil Willey[182] have also made excellent contributions to the history of this ancient conception. Comprehending both real and ideal entities in one symmetrical, unifying series, gratifying the aesthetic sensibility, and influencing both science and mysticism throughout many centuries, this basically a priori and metaphysical conception dominated European thought concerning the sequence of forms in biology and the relation of the earthly hierarchy to that of the transcendental plane until the late eighteenth century. In this latter century, as Lovejoy shows, it began to assume a dynamic significance, and became "temporalised", in an ideal and metaphysical sense at first, and was finally superseded in science by the empirical theory of evolution by descent. It was Leibniz, above all others, who inaugurated this "temporalisation" of the Chain of Being.

All this tends to show that, in the eighteenth century, theories of the compass and succession of life were usually set in the framework of an ancient metaphysical scheme, which had a much greater influence upon biological thought (and especially upon Herder's, as we shall later see) than had either the Scriptures or the empirical data of palaeontology, genetics, etc.

concerning the history of life on earth. As we shall shortly see, the doctrine of a Chain of Being could be and was applied in so many ways by Herder and his contemporaries that we should consider the theory of transformism or evolution by descent only as one possible consequence of a much wider and basically a priori scheme. To discuss the ideas of thinkers of that age only in relation to the Darwinian theory, for example, is to do them an injustice; it serves only as a test of their modernity by the standards of a later age, and it is valueless unless it is complemented by a comparative study of scientific methods in their age and Darwin's; such a more limited approach must fail to reveal the full extent of their ideas in relation to the knowledge and beliefs of their age.

With these considerations in mind, we shall proceed to examine Herder's ideas on the various problems of phylogeny, beginning with that of the origin of life.

a) The origin of life.

(i) The origin of living organisms other than man.

Unlike the problem of evolution by descent, that of the origin of life as Herder deals with it has been generally ignored by critics. Since it involves a choice between creation by a higher being and natural emergence, it implicates theological issues more than most of his other biological ideas.

The clearest statement in the „Ideen" on the origin of life is as follows:[183)]

> Und siehe da, alles dies faßt unser Naturweise [i.e. Moses] in eine Stimme des Weltschöpfers zusammen, die, wie sie das Licht hervorrief und damit der Luft sich zu läutern, dem Meer zu sinken, der Erde allmälich hervorzugehen befahl, d.i. lauter wirksame Kräfte des Naturkreises in Bewegung setzte, so auch

> der Erde, den Wassern, dem Staube befiehlt, daß jedes derselben organische Wesen nach seiner Art hervorbringe und sich die Schöpfung also durch eigne diesen Elementen eingepflanzte Kräfte selbst belebe.

As usual, Herder avoids making a direct choice between extremes and combines them. Creation does take place, but only through the mediation of natural causes. Similarly, Matthew Hale, in a work which Herder possessed,[184] said in 1660 that the earth itself, when life first appeared upon it, „als ein Werkzeug mit der obersten würckenden Ursache concurriret und das Ihrige zu solcher Würckung beigetragen habe".[185]

As Herder makes clear in his „Gott", the creation and sustenance of the universe is effected by „Kräfte", which are ultimately of a divine nature, yet which can perform physical functions (and, as we have seen, are often actually identified with known physical agencies). In a remarkable passage recently published by Dobbek as an appendix to Einsiedel's „Ideen", Herder (for he is the author of the passage in question, according to Dobbek[186]) writes:[187]

> Die Urkraft war so lange dem Ohngefähr unterworfen, bis sie die schwer zu erobernden und mit vielen leidenden Erfahrungen verknüpften Kenntniße der Ur--- [lacuna in text] bewußtseins= loser Substanzen erwerben und sich selber unterwerfen konnte. --- Jetzt hat Gott die Natur kennen gelernt.

The dating of this passage is uncertain,[188] but its unorthodoxy is beyond question. We can thus so far conclude that Herder's theory of creation was by no means orthodox, and that he envisaged a protracted process of creation in time, not a short-lived creative activity on the part of the divinity. This is confirmed by our earlier study of his cosmogony.

We also noticed in our section on cosmogony that the "elements" acted,

for Herder, as subordinate agents or secondary causes in the creation of the earth. We can now add that they performed a similar function in the creation of life itself, in conjunction with the organic „Kräfte" at work within them. Thus, he says that the largest and most powerful animals are still found in areas „wo die Kräfte der Natur am wirksamsten sind."[189] He also says of the prolific species found in certain parts of Asia:[190]

> sie treffen am meisten auf die Gegenden, wo die elektrische Kraft der Sonne, der Luft, der Erde im größesten Strom ist.

This recalls the Lucretian theory that the stronger "elements" of the early earth produced the first living organisms, although, in Herder's case, the theory is tempered by those „Kräfte" which, as we know, permit of either a physical or a hyper-physical construction. But conversely, he writes of the colder, inclement regions of the earth:[191]

> --- da scheinen sich auch nimmer jene Geschöpfe zu entwickeln, zu deren Bildung das ganze Spiel der Elektricität gehöret.

(We should recall at this point that "electricity", in such contexts, is equivalent for Herder to heat or "elemental fire".) On another occasion in the „Ideen", he says of the earth:[192]

> --- hätten sich die Erdharze, die Schwefel in der Menge auf ihr gefunden, in der sich jetzt der Sand, der Thon, und endlich die gute fruchtbare Erde findet: welch andre Geschöpfe hätten auf ihr leben müssen!

Thus, life was produced by „Kräfte", themselves at once divine and physically efficient, through the medium of the "elements" and natural substances found on the earth.

Although the creation of new forms has ceased on this planet, the same

"elements" and „Kräfte" which originally gave it life may still operate on other heavenly bodies. Herder declares in the „Adrastea":[193]

> Der flüssige Aether wird einst auch dem Monde Leben geben und Gedeihen und Wachsthum.

All this brings us to consider the theory of spontaneous generation, which we did not mention in our discussion of embryology, since it is more closely bound up with theories of the origin of life as a whole. In the form in which it was current in Herder's day, the theory taught that living organisms, particularly lower and even microscopic ones, may be generated spontaneously from inanimate substances, under certain conditions, without being reproduced from previously existing parent organisms.

In Herder's day, the embryological theory of epigenesis was nearly always associated with spontaneous generation.[194] In fact, it was largely to avoid accepting the theory of spontaneous generation that some scientists, such as Swammerdam, rejected epigenesis in favour of the preformation hypothesis.[195] But throughout antiquity and the Middle Ages, it was almost universally believed that lower organisms at least could be generated spontaneously, and this belief was not deemed heretical by the Christian Church, since even St. Augustine had accepted it.[196] Indeed, as Zöckler observes, certain passages of the Book of Genesis can be construed in terms of spontaneous generation.[197] Such a verse as the following may serve as an example:[198]

> And God said, Let the earth bring forth the living creature after his kind ---

And Genesis 1, 20 suggested to some exegetes that birds were first created in, or by the waters of the oceans.

However, such ideas were much in dispute in the eighteenth century. On the one hand, notable epigeneticists such as Needham believed in the ancient theory,[199] whereas all preformationists rejected it, as did various experimenters such as Spallanzani[200] in 1766. Already in 1668, Redi had disproved by experiment many supposed instances of spontaneous generation.[201] But even in the early nineteenth century before Pasteur finally disproved all the cases hitherto suggested, Lamarck and others, many of whom were influenced by the current predilection for epigenesis among the „Naturphilosophen", still believed that the phenomenon can, and does, take place all around us.[202]

Herder may well have accepted this theory in his Riga years, as when he says that the ideal art-critic arises spontaneously amidst inferior artistic productions „als sich nach der ältesten und neuesten Philosophie das Lebendige gebiert, aus einer gährenden Fettigkeit: es sei diese der Nilschlamm oder Chaldäens rothe Erde, das Chaos des Epikurs, oder Needhams faulender Tropfen."[203] But although he never applies the hypothesis directly to embryology (i.e. ontogeny), hints of it appear in the „Ideen", applied in this case to the phylogenetic emergence of animal species on the early earth. He says of the smaller fauna of the Americas:[204]

> Mit Mühe haben sich diese gleichsam aus dem warmen Schlamm losgewunden.

He likewise calls the sloth „ein Klumpe des Schlammes, der sich zur thierischen Organisation erhoben."[205] However, the „gleichsam" of the first quotation shows that he did not mean such statements to be accepted without reservation. He uses the theory of spontaneous generation only to explain how life was originally created, but never applies it to the origin of man, as we shall see. He describes the original creation of life in vague terms, and „Kräfte", with all their associations, are introduced alongside the more

overtly materialistic conception of the "elements" and generation by matter and heat. His final words on spontaneous generation by the animating power of heat are as follows:[206]

> Noch jetzt scheint die Sonne, wie sie im Anfange der Schöpfung schien; sie erweckt und organisirt aber keine neuen Geschlechter: denn auch aus der Fäulnis würde die Wärme nicht das kleinste Lebendige entwickeln, wenn die Kraft seiner Schöpfung nicht schon zum nächsten Uebergange daselbst bereit läge.

Besides, as he often reiterates, the "elements" themselves have now lost much of their early vigour.

However, he leaves us in no doubt that he believed that organisms were created successively, as Rouché points out;[207] the lowest forms arose first, and the higher forms later. In fact, even the Book of Genesis names such a sequence, but without the longer time-scale and the palaeontological evidence adduced by Herder and various of his contemporaries. He first says in the „Ideen" that many plants must have flourished and perished before the first „Thierorganisation" appeared.[208] Later, he is more explicit:[209]

> Das Brennbare in der Luft beförderte vielleicht den Kiesel zur Kalkerde, und in dieser organisirten sich die ersten Lebendigen des Meers, die Schalengeschöpfe.

He goes on to speak of „die Muschelform, in die der Kiesel springt",[210] thus again suggesting that the first living forms were generated spontaneously. After the sea-creatures, the plants arose.[211] And in the „Ideen", Part II, he again declares that shellfish arose first, followed by plants, and then the larger animals, such as the elephants and rhinoceroses now found as fossils.[212] But in another passage from the same work he allows the Mosaic narrative, which he here mentions (not Buffon, as Sauter[213] supposes), to

modify his earlier conclusions, and suggests another order of succession, thus contradicting his earlier statements, as the critic May[214] observes:[215]

> Die Vegetation geht voraus --- Der fruchtbare Schoos des Meers folgte mit seinen Geburten.

These two views need not be mutually contradictory, however, if we assume that Herder meant that land-plants arose before the more advanced sea-creatures, while the shellfish etc. emerged even before the plants. But partly because of his own unwillingness to commit himself to any exclusive explanation, and perhaps partly because palaeontological evidence was as yet scant and ambiguous, he does not enter into such details.

However, he usually says that life first arose in the oceans,[216] and justifies his belief by the "precipitation" theory of the earth's origin, already discussed, which states that the primeval air, laden with various extraneous materials, could not at first support life on land.[217] The theory of the marine origin of life had previously been held by Anaximander,[218] de Maillet,[219] Pallas[220] and others; Herder had read works by the two latter writers. Goethe, of course, shared this belief, and Knebel, in a letter to Herder in 1789, later (no doubt under the influence of Herder and Goethe) put forward a more detailed "chemical" theory according to which early life was spontaneously generated in the oceans by the aid of marine salt.[221]

Thus, it appears that Herder supported a broadly naturalistic theory of the origin of non-human life, and, like most epigeneticists, believed in some form of spontaneous generation, in which his „Kräfte" played an important part. This aspect of his biological thought has been almost completely ignored by the critics hitherto. But, since his „Kräfte" can be interpreted

in so many ways, we cannot finally say that he held a materialistic theory of the origin of life in the same way as Lucretius, for example. Living organisms arose in a natural succession, in which ill-defined „Kräfte" acted in an unspecified manner:[222)]

> --- die Gattungen der Geschöpfe folgten einander, wie sie ihrer Natur und ihrem Medium nach wirklich werden konnten.

(ii) The origin of man.

Christian theology, in Herder's day, could in no way be reconciled with naturalistic theories of the creation of man. In this question, there was no room for those "compromise" hypotheses of which Herder was so fond. Just as he analysed the origins of human history in terms of divine first causes, so also did he explain the actual creation of man. This section, therefore, will provide the religious counterpart to the last, which covered Herder's relatively naturalistic ideas on the origin of other forms of life.

In the „Älteste Urkunde", written during his most religious phase, he rejects the naturalistic theory of man's origin which Maupertuis had put forward:[223)]

> War der Mensch das Geschöpf Gottes, und nicht --- Ein Zufall des Zufalls? ein Kothwerk des bildenden Nils ---

And in the same work, he says:[224)]

> --- alles wirst du in Adam finden, und in dem kleinen Umlauf, der ihm ward.

Although he is less explicit in the „Ideen", he does not seem to have altered his opinion, for he calls human beings the „Lieblinge der Natur", implying that their lot is associated with a special providence.[225)]

In our section on diluvial theories and the Noachian Flood, we noticed that Herder believed that not one, but many Noahs may have survived cataclysms such as the Scriptural Deluge.[226] By the same logic, he ought to have accepted the co-adamite or autochthon hypothesis, suggested by several writers of his age. These thinkers maintained that a plurality of Adams may have appeared in various parts of the earth, and they usually used this theory to explain the origin of the human races, postulating black, red and yellow Adams for the respective races.[227] But Herder never wavers from the monophyletic Biblical account. He dismisses the autochthon hypothesis as early as in 1770, in his famous essay on language,[228] and in 1774, he twice affirms that man arose from a single pair.[229] Using his wit as well as his acumen, he cites the celebrated case of the "porcupine man" in England, who was born covered with bristles:[230]

> --- hätte der Stachelschweinmann, der schon einen Sohn nach seinem Bilde zeugte, sein Geschlecht fortgesetzt, so hätte gewiß ein Stachelschweinadam --- erdacht werden müssen.

His view is unaltered in the „Ideen".[231] We may here add that Blumenbach,[232] Kant,[233] Linnæus,[234] and Zimmermann,[235] among writers whose works were known to Herder, also believed that the human species originated from a single stock, while Boulanger, Voltaire and Home, as Rouché observes,[236] as well as Georg Forster and Goethe, as Bruntsch notices,[237] were thinkers Herder knew who upheld the autochthon theory.

Herder likewise repudiated the pre-adamite hypothesis,[238] according to which men existed before Adam. Buffon had entertained this belief, as Sauter points out,[239] and so had all those geological catastrophists, such as Bonnet, who believed that periodic cataclysms overwhelm the earth, destroying all life, which again emerges, in superior forms, from preformed

"germs" which remain unscathed during the upheaval. Here again, Herder adheres to the Biblical narrative.

In the „Ideen", he says that the idyllic valley of Kashmir was probably the earliest home of man, the Garden of Eden of the Old Testament.[240] In the „Journal" of 1769, he had already asked himself where man originated, as he reflected upon the great migrations of peoples within historical times. He weighed the various current hypotheses, without finally deciding between them.[241] In a sketch of 1772, he first names Asia as the homeland of man.[242] He further specifies the „Höhe Asiens" as the oldest seat of human culture in his „Vom Geist der ebräischen Poesie" of 1782,[243] and many times in the „Ideen", he suggests that Asia, particularly its mountain massif, was the site of man's creation,[244] finally naming Kashmir as the exact locality.

It is probable that he first encountered the latter idea in Kant's lectures on physical geography in Königsberg. In Herder's unpublished notes on these lectures (but not in Rink's later published version of Kant's lectures as it appears in complete editions of Kant's works), Kashmir is called a „Parad[ies] zw[ischen] Gebirg[en]";[245] this, of course, immediately suggests a connection with the Garden of Eden. However, Buffon[246] had said that the area around Kashmir and Tibet witnessed man's first appearance, and Pallas, in a work read by Herder, named the valleys to the south of the Asian highlands in the same connection,[247] while Zimmermann, less specifically, said that man first arose in the Asian mountains.[248] (We may observe in passing that it was from such beginnings that the "Aryan" myth arose.)

But before Herder reached his final conviction that man first arose in Asia, he deliberated on two alternative theories. In a „Schulrede" on geography, probably delivered in 1784, he names the Caucasus mountains in

conjunction with the „Höhe Asiens" as the place from which human history began.[249] His friend Einsiedel had written in notes copied by Herder that the country around the (mythical) Mountains of the Moon in the unknown interior of Africa is inhabited by "unmixed" races.[250] Herder did not himself suggest that man ever arose independently in this locality, but he does say that these mountains may be an „Erd=Rücken",[251] a term he usually reserves for the Himalayas, and that „manche glückliche und ruhige Nation", as yet undiscovered, may dwell around them.[252] Perhaps Einsiedel's belief can ultimately be traced back to Genesis 2, 13, where it is said that the second river flowing from Paradise encompasses Ethiopia, known before the eighteenth century to be a mountainous country; but it was Ptolemy's map which first marked the legendary Mountains of the Moon,[253] a name which captured the imagination of the would-be African explorer Einsiedel, and through him, his friend Herder.

One further feature of Herder's ideas on human origins deserves attention. He accepted the Biblical statements concerning the unusual longevity of the early patriarchs.[254] Like Burnet, whose work he knew, he suggested that this longevity was possible because more clement climatic conditions prevailed before the earth's axis shifted.

Thus, we conclude that Herder accepted the Biblical narrative on the creation of man, as did most thinkers of his age, and that he did not extend the naturalistic explanations he had used in discussing the origins of other forms of life to human origins. In determining the place in which man first appeared, he followed the theories of certain contemporary writers whom we have named above.

Before we proceed to examine theories of evolution, a word must be said about the arrangement of topics within this chapter. The "Chain of Being" conception, as we have already remarked, provides a convenient and appropriate frame of reference in relation to which all ideas on evolution (and classification) in the eighteenth century, and Herder's ideas in particular, can be assessed. Now this "Chain" can be considered basically in four different ways in relation to biology. Firstly, it can be seen as a static series of natural entities, arranged in the gradually ascending order of their relative complexity; we have already studied this application in our section on classification, but a few further remarks will be added in the present chapter. Secondly, it can be seen as a dynamic series of natural entities; this corresponds either to the theory of successive creation, in time, of living species, from simple to complex (already discussed in our last section), or, in its later equivalent, to the modern theory of the evolution of species by descent (which we shall examine in the present chapter). Thirdly, it can be applied as a static series of ideal entities, a hierarchy comprising not only the known earthly forms of life, but also transcendental beings such as angels and even the putative denizens of other planets or stars: this application is also relevant to Herder's thought, and we shall discuss it in this chapter. Fourthly, it can be envisaged as a dynamic series of ideal entities; this corresponds to "dynamistic" theories of developing „Kräfte", to the ideas of metempsychosis and palingenesis, and to other related conceptions, which we shall study as they appear in Herder's works.

We shall begin by discussing the first of these applications of the "Chain of Being" in the thought of Herder and his age; this is the static series of natural entities, particularly animal species, on earth.

b) The static series of natural entities: the problem of classification.

In our sections on the universal "type", on the comparative and analogical methods, on classification, and on the "levels of organisation", we saw that Herder treated the known and visible portion of the "Chain of Being", which extends from formless, inanimate matter up to the human organism, in a broadly naturalistic way, and that he advocated some relatively modern methods of biological classification.

One of his major achievements in this connection was to realise that a fundamental similarity obtains among all animal forms. As Siegel says, such a realisation was a necessary precondition of the nineteenth century theory of evolution by descent,[255] and Thienemann correctly relates this later doctrine to the older belief in a natural "Chain of Being":[256]

> Der Gedanke der „natürlichen Stufenfolge" oder der „Kontinuität in der Natur" gab so eine Grundlage ab, auf und aus der der Deszendenzgedanke mit hervorging.

Herder, in fact, already speaks of a natural „Kette"[257] or „Leiter der Wesen"[258] in the „Journal" of 1769, and it appreciably influenced many of his later ideas, as we have seen in various earlier sections. He describes the same natural sequence in the „Ideen". As Siegel acutely observes,[259] some passages in which Herder appears to be describing a dynamic (i.e. Darwinistic) succession of organisms are simply new enumerations of the static series of forms in the natural "Chain". One such ambiguous passage from the „Ideen", quoted by Siegel, should illustrate this:[260]

> So gehet's aus dem Staube der Würmer, aus den Kalkhäusern der Muschelthiere, aus den Gespinnsten der Insekten allmälich in mehr gegliederte, höhere Organisationen. Durch die Amphibien gehets zu den Landthieren hinauf --- (etc.)

In another similar passage, which Siegel also quotes, Herder really only says that organisms emerged or were created successively, not that they are descended from one another.[261)]

However, the very circumstance that descriptions of the static series of natural forms, in accordance with the "Chain of Being" conception, can seem so deceptively close to the dynamic Darwinian theory, corroborates our initial contention that this ancient conception of a gradually ascending natural hierarchy was a necessary step towards the modern theory of the evolution of species by descent.

c) The dynamic series of natural entities: the problem of evolution.

(i) The theory of transformism, or evolution by descent.

We can freely say from the outset that Herder did not believe that extant plant and animal species have evolved by descent from each other or from extinct common ancestors. The long and needless controversy which raged among Herder critics over this question has been admirably analysed by M. Rouché in his "Herder, précurseur de Darwin? Histoire d'un mythe" (1940). As Rouché points out, Herder did accept the idea of gradual evolution in astronomy and geology, but he never applied it to the community of living species.[262)] In this section, we shall confine ourselves to a brief summary of the evidence from Herder's works, with some reference to earlier criticism and a few remarks on the ideas of Herder's contemporaries.

Herder uses the word „Evolutionen" in 1792, but not in connection with biology; he uses it to describe gradual development, as opposed to more violent „Revolutionen", in both history and geology.[263)] The word was also used in biology in the eighteenth century, but only as a synonym for the

"preformation" hypothesis of the embryo, and it only acquired its present meaning at a later date.

Three sentences selected from the „Ideen" may show conclusively that Herder did not believe that species have evolved by descent. The first is as follows:[264]

Kein Geschöpf ist aus seiner ursprünglichen Organisation gegangen.

In the second, he says that man and the apes were never „Ein' und dieselbe Gattung".[265] And thirdly, he describes an ancient Tibetan evolutionary myth as „diese entehrende Tradition, --- die den Menschen vom Affen her=leitet".[266] Besides, we noticed in our section on the origin of life and of man that he believed the creation of new species to have ceased long ago, whereas the modern theory of evolution teaches that the process continues indefinitely.

Notwithstanding these unambiguous utterances of Herder's, numerous critics, as Rouché shows, have attempted to prove that Herder was a precursor of Darwin. We may add to those named by Rouché the Marxist Reimann, who declares in 1929 „daß wir hier [i.e. in the „Ideen"], achtzig Jahre vor Darwin, nahezu glauben können Darwin zu lesen".[267] Even after Rouché's work appeared, E. Neumann, in an article of 1941, contends:[268]

> Herders Verdienste um die Entwicklungstheorie sind bisher nicht gewürdigt worden --- Er ist unverstanden geblieben.

And, even in 1954, Harich declares, without sufficiently qualifying his assertion:[268a]

> Geologisch und biologisch nimmt er [i.e. Herder] den entwick=lungsgeschichtlichen Standpunkt von Lamarck, Lyell und Darwin vorweg ---

A word must also be said about the ideas which prevailed in Herder's

age concerning the history of living species. Lovejoy notices that Leibniz had briefly expounded a theory of evolution by descent in 1710;[269] naming Maupertuis, Diderot, Monboddo and others, he says in another work that the decade 1745-1755 saw the first appearance of the modern evolutionary theory in its basic elements,[270] and later adds that it was "almost a commonplace" in Herder's day.[271] Rouché more guardedly writes that vaguely evolutionary ideas are to be found in the works of Buffon and de Maillet, both of which Herder knew,[272] but Kohlbrugge lists 34 writers who, he claims, believed in some kind of evolution at or before Herder's time.[273]

However, as we earlier remarked, all of these earlier evolutionary theories lacked that foundation of exact evidence from palaeontology and genetics which the nineteenth century eventually accumulated, and some of them, like those of the pre-Socratic philosophers and of primitive mythology, were totally fantastic. Moreover, we cannot agree that the theory was a "commonplace" in Herder's day, as Lovejoy claims. As Clark[274] and several other critics have noticed, Kant, when he realised in his review of Herder's „Ideen", Part I, that the animal "type" and the numerous analogies between species which Herder had so vehemently emphasised could be explained by a relationship through descent, at once hastened to add:[275]

> Nur eine <u>Verwandtschaft</u> unter ihnen [i.e. animal species] --- würde auf Ideen führen, die aber so ungeheuer sind, daß die Vernunft von ihnen zurückbebt, dergleichen man unserm Verfasser [i.e. Herder] ohne ungerecht zu sein, nicht beimessen darf.

This is not a reaction we should expect in face of a "commonplace". Furthermore, even although Kant later used the evolutionary theory as a working ("<u>regulative</u>") hypothesis in 1790, as Lovejoy also notices,[276] it is clear from his review of Herder's work that he considered it too extravagant an

idea to be taken literally for a single moment. Of other early theories of evolution, some, like that of the older Linnæus,[277] were applied only to a few species or varieties, and others, like those of Maupertuis and Diderot, not only lacked detailed support, but, especially in France, arose within a philosophical movement whose aim was as much to question nearly all traditional values as to advance scientific knowledge. Besides, the shorter geological time-scale in which nearly all thinkers then believed made it hard to imagine that all known species could have evolved by descent in so short a time.

Thus Herder, in denying the theory of evolution by descent, which he had undoubtedly encountered in works of some of the above-named writers, most of whom he mentions at some time or other, was quite typical of his age. Like Kant, he doubtless found it impossible to accept such theories literally, because of the difficulties we have named. His theological beliefs would certainly never have allowed him to admit that man had evolved from other less advanced species, as we saw in discussing human origins. But just as he was quite prepared to admit that other forms of life could be generated spontaneously, finding theology no obstacle here, so also had he no theological reason for denying that species other than man have evolved by natural descent; here as before, he could easily have used a „Kraft" theory of evolutionary change to leave the way open for more than one interpretation. In fact, he raises no objection whatsoever to the notion of Pallas, whom he quotes in this connection, that the dog is descended from the jackal.[278]

We conclude that Herder's religious beliefs would always have made it impossible for him to accept the idea that man evolved from lower creatures, but that his reason for believing that other species did not evolve by descent was not a theological one; it was rather because current evolutionary

theories seemed extreme, ill-founded, and generally incredible to most men of his age. Yet as Lovejoy declares:[279)]

> --- Herder's book [i.e. the „Ideen"] is certainly full of aperçus that come near to the evolution theory; and it unquestionably helped to produce a state of mind favourable to the acceptance of the theory.

This was not because Herder entertained any serious belief in evolution, but because, along with certain other writers of his age, he drew important naturalistic conclusions from the ancient conception of a static Chain of Being, as we earlier saw, and because he helped to lend it a new temporal or dynamic significance. We shall return to such temporal applications later.

(ii) Palaeontology and the theory of natural selection.

The science of palaeontology was only in its infancy in Herder's age. Such men as Camper and Merck had begun to suspect the great antiquity of fossil remains, but they usually erred in relating them too closely to existing species.[280)] Buffon had postulated a longer time-scale and extensive climatic changes in order to account for the presence of fossil tropical animals in the North,[281)] while Forster,[282)] Blumenbach[283)] and a few others were beginning to realise that such remains as the recently discovered saurian petrefacts of Ohio were those of species long extinct. Zimmermann tried to circumvent this problem by saying that such apparently extinct fossiliferous species probably still survived on earth, but had not yet been discovered; he further stressed the difficulty of correctly reconstructing fossil skeletons.[284)] Woodward first put forward the sedimentation theory of fossils, but, like most others at that time, he linked his theory too closely to the Noachian Deluge,[285)] and Goethe, in a much-

quoted letter to Merck in 1782, declared, probably under Buffon's inspiration:[286]

> Es wird nun bald die Zeit kommen, wo man Versteinerungen nicht mehr durch einander werfen, sondern verhältnißmäßig zu den Epochen der Welt rangiren wird.

But alongside such relatively enlightened views, more naïve and fanciful ideas survived. The noted scientist Sömmering suggested to Merck in 1786 that the fossil mammoth might have been a cross-breed („Bastard") between the elephant and the rhinoceros,[287] and another of Merck's correspondents suggested in 1783 that the larger tropical animals found as fossils in Northern Europe were the remains of circus animals imported for Roman entertainments.[288] Voltaire declared that fossil shells found at high altitudes on land were pious relics dropped by pilgrims returning from the Holy Land.[289]

Herder had encountered the ideas of all these thinkers (with the probable exception of the amateur palaeontologist who appealed to the Romans' love of circuses). He realised in 1769 that marine fossils on land had been deposited during prolonged periods of sedimentation in the early oceans.[290] Like Woodward, he came to associate the larger fossils in the North with a sudden inundation, but, unlike some of the more fanciful writers, he did not contend that they had been swept bodily from the tropics, and said, like Buffon, that they were overwhelmed in their usual habitat while the Northern climate was warmer.[291] He cites both Buffon and Pallas on the tropical remains in the North,[292] and, like Goethe (and probably under his influence), he upholds the stratigraphic method, contending that different fossils occur in different strata, which date from successive periods, and he correctly says that the higher strata contain the remains of more advanced creatures than the lower ones, adding that the supposed fossil "men" in lower strata

are not authentic.[293] On another occasion, he readily concedes that the North American fossils may include those of extinct animals,[294] and says elsewhere that the mammoth is now extinct.[295]

Thus, Herder's views on palaeontology are representative of the more advanced trends in that subject in his day, and (with the exception of the diluvial hypothesis, common in contemporary geology) are in no way influenced by theological considerations.

Since Herder believed that certain species have become extinct, we might readily imagine that he had some inkling of the evolutionary principle now known as "natural selection". We analysed the methodological implications of this doctrine in our sections on dialectics and natural law, and discovered that Herder often uses it as a method of describing natural processes and dynamic equilibria. But he applies it to the history of life only in a non-evolutionary sense. Some older species may disappear, he believes, but no new ones are created. A new equilibrium is reached, and, while individuals may perish, most species succeed in surviving. Several utterances to this effect occur in the „Ideen",[296] and, as we earlier noticed, the theory of universal conflict enunciated in the 1769 manuscript published by Irmscher is of a similar, but more general kind.

Kühnemann has drawn attention to this idea of Herder's,[297] and Lovejoy, as we earlier saw, says that such insights undoubtedly influenced later theories of natural selection, even if they did not fully anticipate Darwin's evolutionary version.[298] Götz shows that Herder's idea of the "survival of the fittest" does not imply that new species evolve, and rightly says that this struggle helps only to <u>preserve</u> existing species.[299] Schmidt=

Cürtow is of the same opinion,[300] which Rouché also shares.[301]

As we earlier remarked, Lucretius, Hobbes, and (in Herder's lifetime) Malthus and Adam Smith put forward similar ideas, but, of these thinkers, only Lucretius applied his version of the hypothesis to the whole community of animal species, and said that some earlier species were less equipped for survival than others:[302]

> Thus, doomed by Chance, they liv'd an easy Prey
> To all, and thus their Kinds did soon decay.

Einsiedel had similar ideas; this becomes specially clear from certain passages in his „Ideen", which Dobbek recently published from Herder's transcripts. Einsiedel says of animal species:[303]

> Was vertilgt werden kann, ists längst worden.

In another passage, he says of them:[304]

> Sie vertilgen und werden vertilgt, doch nie ausgerottet.

But, like Herder and Lucretius, he does not suggest that new species emerge in the process. Bonnet also had believed that a form of natural selection takes place, as Rouché points out, but only in the form of progress towards a superior natural equilibrium.[305] Ray, whom Herder also mentions, had likewise mentioned such theories, but only to reject them as a "grand subterfuge of the Atheists".[306] Maupertuis revived Lucretius' theory that the more poorly equipped species produced by fortuitous creation soon became extinct,[307] and Buffon declared:[308]

> Tout ce qui ne se nuit point assez pour se détruire, tout
> ce qui peut subsister ensemble, subsiste ---

Such theories of struggle are also related to the Chain of Being conception,

for the Chain, between whose "links" transitions were thought to be gradual, postulated a "full" universe, a plenum; Leibniz expressed this consequence in his "principle of plenitude". But since a full universe involves beings of all possible kinds, struggle is inevitable, yet the equilibrium of the Chain is preserved. By Herder's time, palaeontological discoveries were beginning to modify this doctrine, since some thinkers realised that whole species could, and actually had become extinct. Thus the revised theory of struggle meant that whole links in the Chain could drop out. This was half-way between the principle of plenitude and the theory of natural selection.

We conclude that Herder's theory of the "survival of the fittest" was quite different from Darwin's theory of evolution by natural selection. It was not peculiar to him either, but had been applied to biology, in a similar way, by several earlier thinkers. The roots of Herder's theory of struggle, as they are revealed in his 1769 manuscript on planetary souls, were thoroughly Lucretian and non-teleological, although this theory became blended with the teleological conception of increasing progress towards eventual social equilibrium when Herder applied it to human history in the „Ideen".

(iii) <u>The theory of evolution by adaptation; the rôles of environmental determinism and heredity; the evolution of the races of man</u>.

It can be shown that Herder's theory of environmental determinism has four main connotations. The first is the idea that living organisms are physically changed by the influence of their environment; we shall discuss this idea in the present section. The second is the theory that the psychological constitution of the human individual is shaped by its external environment; we have already examined this conception while reviewing

Herder's attempts to solve the so-called "problem of perception". The third application might be called the theory of sociological or cultural determinism. This is the best known side of Herder's theory of environment, and it is manifest in his writings from an early date. It is, in fact, the famous theory of "milieu", which states that all social and cultural phenomena, including works of art, can be understood only in relation to their environment, in the widest possible sense of this term. We made some reference to this idea in our earlier studies of Herder's "genetic method", his sociological pseudo-laws, and the supposed „Analogie" between physical and moral worlds. In the present section we shall add a few further remarks upon it. Fourthly, the theory of environmental determinism, when applied either to individual or to social psychology, raises the philosophical problem of free will in its relation to determinism. We dealt briefly with this topic when we analysed the problems of causality and of natural laws in Herder's thought; some interesting observations upon it are to be found in the article and book of G.A. Wells.[309)]

However, let us now pass on to the theory of physical determinism, since it is directly relevant to the problem of evolution. Now Herder suggested several (basically three) different and contradictory answers to the problem of perception - i.e. a deterministic or objectivistic one, a theory of „Analogie", which implied that subject and object are preadapted to one another, and a subjectivistic one which emphasised the power of the subject itself to shape its perceptions of the external world. He answered the problem of natural law and the social world in the same complex way - i.e. he sometimes adopted a deterministic approach, suggesting that objective physical laws <u>actually</u> influence the mental or moral world, at other times

he maintained that the two worlds are "analogical" or preadapted to one another, and yet again, he attributed to natural laws such values as beauty and wisdom, which are normally associated only with the (emotive) subject. We shall now discover that he follows exactly the same procedure in dealing with the problem of physical determinism, or of the relation between the organism and its environment. (Such parallelisms between different levels are a striking feature of Herder's thought; we have tried to explain how they came about in our sections on holism and on parallel "levels of organisation".) Firstly, he frequently suggests, after the manner of Lamarck, that the organism can be physically changed by environmental influences, and that such changes are inherited. At other times he seems to suggest that the organism and its environment are teleologically pre-adapted to one another. And thirdly, he often declares that the inward influence of heredity is much more powerful than any external determinants. In the „Ideen", as we shall see, he considers that, in the long run, environment and heredity are almost equally important, just as he concluded, in psychology and sociology respectively, that subject and object, and natural law and moral order, perform equally important functions.

Firstly, we shall examine the ways in which organisms can be physically influenced by their environment.

A. Animal adaptation.

Herder often says that the organism is adapted to its environment, as in the following passage,[310] which Siegel[311] also quotes:

> Der Vogel fliegt in der Luft: jede Abweichung seiner Form vom Bau der Landthiere läßt sich aus seinem Element erklären; sobald er --- die Erde berührt, wird er (wie in Fledermäusen und Vampyrs)

> dem Gerippe des Menschen ähnlich. Der Fisch schwimmt im Wasser; --- Sobald er die Erde berührt, wickelt er wie die Manati wenigstens die Vorderfüße los, und das Weib bekommt Brüste.

As Siegel remarks,[312] this passage does not imply that any evolutionary change takes place in time. It simply describes, without explaining, the adaptation of the organism to its environment, and shows how Herder, like many of his contemporaries, was led by the doctrine of the Chain of Being, between whose links transitions were supposed to be gradual, to contemplate "transitional" creatures like bats, the manati, and (on other occasions) the zoophytes, hydra, etc.

In other parts of the „Ideen", Herder is more explicit, and explains adaptation by the direct influence of climate. A few examples may illustrate this:

> Mannichfaltigkeit des Erdreichs und der Luft macht Spielarten an Pflanzen, wie an Thieren und Menschen. 313)
>
> Auch die Gattungen, die fast überall auf der Erde leben, gestalten sich beinahe in jedem Clima anders. 314)
>
> Die Bewohner künftiger Klimate werden uns nicht gleichen. 315)

As Siegel[316] and Rouché[317] point out, he sometimes explains racial characteristics in man as resulting from a Lamarckian process of adaptation. For example, he considers that the Mongolian physique has been produced by acquired characteristics which have become hereditary, just as Erasmus Darwin[318] and Lamarck did in later years. However, the Epicureans and other earlier thinkers had believed that organs develop with use and weaken with disuse,[319] so that we cannot call Herder's "Lamarckian" views entirely original. However, Goethe was probably influenced by Herder when he wrote in 1795:[320]

--- das Thier wird durch Umstände zu Umständen gebildet.

We have already seen that Herder did not believe in evolutionary transformism. Nonetheless, Götz,[321] Siegel,[322] and many others have realised that he does believe that new varieties, if not new species, may be produced by the influence of environment. A list of references to passages of this kind in the „Ideen" should suffice here, since critics are now more or less agreed on this point.[323]

Several writers whose works Herder had read, among them Hale[324] and Pallas[325] also believed that new varieties may be produced by environmental influences, and, as we earlier remarked, Pallas even thought that the dog, a distinct species, is descended from the jackal. Forster and Kant also believed that limited variations may occur among species, as Bruntsch points out.[326]

Bruntsch was also the first to show that Herder regarded such limited variations in species as degenerative, since each species is best suited to the area in which it was originally created, so that variations take place only when it leaves this area, or when the climate changes.[327] Rouché also emphasises this aspect, and says that Herder's theory of adaptive degeneration comes originally from Buffon and Blumenbach, and that it cannot be called Lamarckian in the evolutionary sense.[328] Elsewhere in the same work, Rouché notices that Zimmermann, whom Herder had also studied, had a similar theory of adaptation.[329]

B. Environmental determinism.

We may now ask exactly what Herder understood by "environment". Unfortunately, he never clearly distinguishes between the "environment" which can bring about physical changes in the organism and that which influences the

human mind and all cultural phenomena in particular. We may therefore digress at this point in order to give a brief account of his theory of "milieu" or of environmental determinism in the widest sense.

He uses the word „Klima" to describe both sides of his theory, and we noticed in our section on meteorology that the idea of „Klima" is far too vague, as he employs it, to provide any satisfactory theory of climatology. His first list, in 1765, of determinants which act upon man in particular, is borrowed from the anonymous author of the „Geschichte des menschlichen Verstandes", and includes subjective ones such as „Genie", as well as physical and climatic, social, religious, and fortuitous ones.[330] In the „Ideen", determinants acting upon man again include both inward or social ones and external ones which we should today call "climatic". In fact, he enumerates as the main influences heat and cold, electricity, air (or vapours in the air), altitude, the nature of the soil and its products, food and drink, „Lebensweise", type of work, dress, „gewohnte Stellungen", and pleasures and arts.[331] Rouché,[332] Schwarz,[333] and Steinborn[334] remark upon this composite "climate" of Herder's, and Schwind[335] rightly equates it to the wider modern conception of "environment", as we also have done.

As Rouché points out,[336] Falconer's work on climate, which Herder had read, lists temperature, air, situation, topography, population, food, and way of life (c.f. Herder's „Lebensweise") as components of "climate".[337] Einsiedel too considered that population exerts an important influence upon social development,[338] although Herder did not. Hippocrates, whom Herder called „für mich der Hauptschriftsteller über das Klima",[339] listed seasons, winds, waters, direction of outlook, topography, and way of living as determinants which work upon man,[340] and Kant, as it appears from Herder's

unpublished notes on his lectures on physical geography, included topography, population and way of life in his list of "climatic" influences on man:[341]

> Je mehr Ackerb[au] desto + [=mehr] Leute z.E. China kaum Raum: also aus dem Clima und Lebensnot folgt [sic].

Herder himself names Hippocrates, Plato, Aristotle, Galen, Huarte, Zimmermann and Winckelmann, in 1767, as writers on climatic determinism with whom he is familiar.[342] And in the „Ideen", as well as the writers already mentioned, he names Wilson, a writer on climate, in a similar connection.[343] Gillies observes that Blair and Blackwell influenced Herder's theory of milieu,[344] Koller cites Ibn Khaldun and Bodin as precedents, and Du Bos, Buffon, Montesquieu and Hamann, apart from others already named, as thinkers who influenced Herder's theory,[345] Schütze also compares Herder's theory with those of Augustine, Vico, Buckle and Taine,[346] and Rouché names Barclay, Fontenelle, Temple and Chardin, besides some of those listed above, as other exponents of a "milieu" theory.[347] To this long list, Bruntsch adds the name of Strabo,[348] and Regli that of Iselin.[349]

From all this, we may conclude that Herder's theory of physical determinism in the „Ideen" is simply a more specialised version of his earlier and wider theory of cultural and social determinism. In the case of plants and animals, all the determinants he enumerates, such as heat and cold, electricity (and other supposed aerial „Kräfte"), air, altitude, soil, and food and drink, but not the specifically human ones, such as „Lebensweise", dress, „gewohnte Stellungen", pleasures and arts, may be expected to aid in producing physical variations. Physical peculiarities in certain human races are presumably produced by the same agencies which cause animal variation, together with „Lebensweise", dress, and „gewohnte Stellungen", while

purely abstract cultural phenomena, such as the arts, would not bring about physical changes in man, but only mental ones.

However, we noticed in our discussion of the „Analogie" between physical and moral worlds that Herder also believed that physical influences can act at times upon mental and even moral states. He shares this belief with such thinkers as the early Kant, who, according to Herder's unpublished notes, observed in his lectures that the mountainous nature of parts of Britain induces a spirit of bravery in the inhabitants.[350] Du Bos likewise said that emotions and national character can be influenced by climate,[351] Einsiedel believed that it determines „die ersten Individuellen Vorstellungen einer Nation",[352] and Hippocrates declared that the seasons influence human "passions".[353]

Herder's particular theory of <u>animal</u> adaptation was influenced mainly by the writers whom we named in connection with it, while Kant, Hippocrates, Winckelmann, Zimmermann, and Buffon probably had as great an influence on his theory of both physical and cultural determinism, in the <u>human</u> sphere, as had any other writers. As we have seen, Herder himself says that, in his own opinion, Hippocrates is the chief writer on climate.

A word may now be said about some distinctive features of Herder's theory of environment. Gillies speaks of the influence upon Herder of Buffon's "more vitalistic" approach in contrast to Montesquieu's "merely mechanical" one,[354] Steinborn observes that Herder's determinism is less crude than Montesquieu's,[355] and Clark contrasts Herder's more moderate approach with the "extreme environmentalism of Wolff, Blumenbach and others".[356] In fact, with the exception of a few rare cases of extreme determinism, when Herder, for example, as Steinborn observes,[357] declares that the Eskimos have become smaller, just as a piece of metal contracts, through the effects

of cold, his theory of determinism is usually tempered by his vitalistic „genetische Kraft", which resists and modifies climatic and environmental influences. Even the instance named by Steinborn is simply taken from the work of the Greenland explorer Cranz, as Grundmann shows,[358] and is quite untypical; Zimmermann too had said that the cold „preßte --- zusammen" the Eskimos' physique.[359] Earlier writers such as Du Bos had put forward much cruder and more mechanical views,[360] leaving little room for an adequate theory of heredity, and Montesquieu, as Herder himself remarks, had built his whole theory of climate on some very unrefined observations upon the expansion and contraction produced in the „Faserngewebe" of the human body by changes in temperature,[361] and upon „das trügliche Experiment einer Schöps=Zunge" which altered physically as it froze and thawed.[362]

But Herder's theory of environment was tempered not only by that vitalism which we shall shortly discuss in connection with his theory of heredity. Falconer, as Günther points out in his history of eighteenth century anthropology,[363] had declared that the combined influence of many external causes produces a composite effect upon the human organism which differs from the effects produced by each cause taken separately. Similarly, Herder speaks of climatic „Umstände, die in ihrer lebendigen Verbindung viel wirken; alle sie gehören zum Gemählde des vielverändernden Klima".[364] The words „lebendige Verbindung" and „Gemählde" at once suggest a holistic, or rather organicistic approach, similar to that of Falconer. This "organic" action of external influences manifests itself physically in far-reaching changes which are produced in the <u>whole</u> organism; this theory that the body reacts holistically to external influences has already been discussed in our section on holism and organicism, in relation to the later Darwinian theory of "correlation of parts" and to Herder's own principle of „Kompensation".

In the light of all this, we can agree with Rouché[365] that Herder's theory of "climate" was relatively modern, and superior to most equivalent theories of his own and of previous ages, although he never coupled it with a theory of evolution by descent, as Lamarck did.

C. Teleological preadaptation of organism and environment.

We now come to the second aspect of Herder's solution to the problem of the organism and its environment. This is the supposition that the two are mutually preadapted. As Rouché says:[366]

> Pour Herder la fonction ne crée pas l'organe, comme l'admettent les évolutionistes: tous deux sont donnés ensemble dès la Création.

And Siegel draws attention to the following words from the „Ideen":[367]

> Sie [i.e. die Natur] dachte ihm [i.e. dem Geschöpfe] vor, da sie diese Kräfte in solche und keine andre Organisation setzte ---

We may add to this the following words from Herder's language essay of 1770:[368]

> Nun ist offenbar der ganze Erdboden für das Menschengeschlecht und dies für den ganzen Erdboden gemacht.

And fourthly, we noticed in our discussion of teleology that Herder once says that nature mercifully leaves an organ dormant where it cannot be satisfied.[369]

However, this idea of teleological preadaptation does not really contradict Herder's other theory of adaptation and environmental determinism, since the teleological explanation applies to animal species only as they were initially created, whereas the theory of natural adaptation applies to them only when they have left their original climate and habitat, or when the climate itself has changed. Besides, even the teleological theory contains

a more naturalistic element than critics have supposed. For the organism and its environment were not preadapted simply by a miraculous act; the organism is adapted to its environment simply because it was originally produced by it, by some process of spontaneous generation in which undefined „Kräfte" played their part. Herder declares „[daß die] Stimme des Welt=schöpfers --- lauter wirksame Kräfte des Naturkreises in Bewegung setzte, so auch der Erde, den Wassern, dem Staube befiehlt, daß jedes derselben organische Wesen nach seiner seiner Art hervorbringe ---".[370)]

D. The relationship between heredity and environment.

Having discussed environmental and physical determinism, or the influence of external factors upon the organism, and the idea of teleological preadaptation, which implies that environment and organism are initially matched, without any change taking place in either, we now come to the theory that heredity, an internal characteristic of the organism, exerts just as important an influence upon it as does the outside environment. This theory of heredity, we may add, only modifies, but does not contradict the theory of environmental determinism, which we have just discussed.

In the section on ontogeny, we saw that Herder believed that the same „genetische Kraft" first forms the animal embryo and then sustains it as an independent organism until age overcomes it. This „genetische Kraft", as he calls it, represents the permanent, inherited characteristics of the organism, and before the latter can be altered by outside influences, the „Kraft" itself must be changed. (We remarked upon this in connection with the principle of „Kompensation".) Thus, Herder makes the same „Kraft" responsible for embryological, physiological and genetic functions in biology. Let us now examine his ideas on genetics in further detail.

Already in 1767, he believed that „Generation" is of greater importance than „Clima" in producing human beauty:[371]

> --- wenn das Clima nichts als ein entferntes Medium ist, so ist die nähere Ursache der Schönheit Generation.

And in 1781 he disagrees with those who, like Locke, declare that the child's mind is like a blank sheet yet to be written upon, and rightly says instead that certain psychological dispositions may be hereditary.[372] In that same year, Georg Müller, on a visit to Herder, writes in his diary (no doubt recording Herder's words, as Suphan believes):[373]

> Klima giebt nie der Nation Schwung und Geist, der liegt in dem Samen der Väter. Klima befördert, wie guter Boden eine edle Rebe.

And again in 1787, Herder speaks of „die Gestalt der Menschen, die mehr vom Stamm als vom Himmelsstrich abhängt".[374]

We noticed in our study of animal adaptation that, as Siegel[375] and Rouché[376] had shown, Herder believed that certain acquired (racial) characteristics, such as the Mongolian physique, which was supposedly shaped by their way of life, are inherited, just as Lamarck later said. Yet, as Rouché remarks in his work on Herder and Darwinism, Herder denies elsewhere in the „Ideen" that deformities produced by artificial means can be inherited:[377]

> Jahrhunderte lang haben Nationen ihre Köpfe geformt, ihre Nasen durchbohrt, ihre Füße gezwungen, ihre Ohren verlängert; die Natur blieb auf ihrem Wege --- Ganz anders, sobald die Misbildung genetisch war und auf Wegen der Natur wirkte.

But we should add that, in the same work, he had already said of those

Orientals who deform their ears and feet:[378]

> Man schämte sich seiner [i.e. original Mongolian] Bildung und wollte verändern; traf aber auf Theile die, da sie der Veränderung nachgaben, sich als die häßlichste Schönheit zuletzt vererbten.

Here, rather in contradiction with the previous passage, he implies that artificial changes to certain parts of the body, over a sufficiently long period, may indeed become hereditary. This would be similar to his idea that the Mongolian physique originally resulted from changes produced by environmental influences, which were finally inherited, but this contradiction shows that his views on the subject were not settled.

Before we leave Herder's own statements on heredity, we may point out that he knew of inherited illnesses, and of genetic atavisms.[379]

Siegel sums up Herder's theory of heredity as follows:[380]

> --- es entsteht ein Konflikt zwischen genetischer Kraft und den klimatischen Kräften z.B., und nur in dem Maße, als die genetische Kraft in diesem Zwiste besiegt wird, können Modifikationen zu stande kommen.

Herder says himself of "climate" and heredity in the „Ideen":[381]

> Beide Streitführende Mächte sind also von großer Wirkung --- Das Klima ist ein Chaos von Ursachen [N.B. this conflicts with the "organicistic" approach to climatic determinism Herder adopted elsewhere in this work], die einander sehr ungleich, also auch langsam und verschiedenartig wirken, bis sie etwa zuletzt in das Innere eindringen und dieses durch Gewohnheit und Genesis selbst ändern; die lebendige Kraft widerstehet lange ---

As an exact basis for genetics and the science of human heredity, Herder's ill-defined, vitalistic „genetische Kraft" is, of course, quite

unsatisfactory. Nonetheless, it was this which, as we have seen, helped him to overcome the crude mechanistic determinism postulated by Montesquieu, Du Bos and others, and to leave the way open for a true understanding of how important heredity actually is. We have often said before that his „Kräfte" are of scientific value only when they are potentially reducible to exact quantities. His „genetische Kraft" is of this kind, for it denotes some internal characteristic of the organism which, if altered, can produce inherited changes, while other, more superficial changes are not passed on. Just such a factor exists, according to modern science. As Bertrand Russell writes:[382)]

> --- the evidence is now overwhelming that, with possible rare exceptions, the only acquired characters that are inherited are those which affect the germ cells, which are very few.

Herder's „Kraft" introduced an inward dimension to balance the outer factor of environment; to use Claude Bernard's phrase, we can say that it constituted a kind of "internal environment" which links together all those parts which can be modified by outside influences. In itself, as a vitalistic quality, it was unscientific, but it was sufficiently related to observed phenomena to be interpreted quantitatively when genetics arose as an exact science.

In conclusion, we must say something about Herder's sources, and the ideas of his contemporaries on heredity. Hippocrates, writing on the macrocephali who were supposed to elongate their infants' heads, maintained that such artificial changes are inherited.[383)] Herder denies this on one occasion, but, as we noticed, believes that it can occur under certain circumstances. He thus adopts a position midway between that of Hippocrates and that of Kant, who denied that any artificially acquired characteristics

can be inherited.[384] Blumenbach, like Herder, said that artificial changes may produce a permanent effect over a period of time,[385] and Camper said that only "climate", but not artificial deformation, has caused racial differentiation in man.[386] As Clark observes, Thomas Abbt, with his belief that genius is compounded of both genetic and environmental elements, probably influenced Herder's ideas on heredity.[387] These various writers seem to have provided the major sources for his theory of heredity, although the vitalism which goes with it is largely his own.

E. The origin of the human races.

One thing at once strikes us about Herder's ideas on heredity. They concern only the human species. This is because, like most of his contemporaries, although he did not believe in evolution, he still had to explain how the different races of man have sprung from a common stock. As Rouché suggests, it was this conflict between the (originally Biblical) doctrine of a single human origin and the known reality of present racial differences which produced Herder's "Lamarckian" theory of human adaptation.[388] Since the problem of racial differentiation is thus logically connected with that of heredity, we shall examine it here.

Man first appeared in Asia, Herder believed. He tried to justify this providential choice by teleology:[389]

> Wenn die Gottheit nicht unsre ganze Erde zum Sitz der Schönheit machen konnte: so ließ sie wenigstens durch die Pforte der Schönheit das Menschengeschlecht hinauftreten und mit lang eingeprägten Zügen derselben die Völker nur erst allmälich andre Gegenden suchen.

For, unlike Winckelmann, he believed that the temperate zone of Asia, not Greece, first produced the ideal human form. However, it was probably

through the influence of Hippocrates, not of teleology, that he acquired his predilection for the temperate Asian climate. For Hippocrates said that the men of temperate Asia were "fairer and larger" than others.[390]

We have seen that Herder thought that no new species were created after the "elements" of the early earth had lost their original strength. He uses this belief in more potent early "elements" to explain the origin of races. This removes the apparent contradiction, which puzzled the critic May among others,[391] between Herder's remarks on the Mongols, who did inherit acquired characteristics (while the climatic "elements" were still strong), and his later remark that artificially acquired characteristics cannot be inherited (because the "elements" are <u>now</u> weaker). Herder says explicitly that negroes became black because the "elements" were more potent when they settled in their present habitat.[392] He likewise says of the Mongols:[393]

> --- sollte es nicht wahrscheinlich seyn, daß vor Jahrtausenden schon, da vielleicht einige dieser ["climatic"] Ursachen noch viel stärker wirkten, eben hieraus ihre Bildung entstanden und zur erblichen Natur übergegangen wäre?

Not only climatic agencies but human activity too was probably more vigorous in that early era, he seems to imply, for he is speaking here, among other things, of the Mongols' physical adaptation to horsemanship and other habits of steppe-dwellers. He thus appears to believe that acquired characteristics were more easily inherited in the halcyon era of the earth's youth, when the present races first arose out of one stock as they migrated to different regions.

However, Herder denied that the present racial differences are well-defined:[394]

> Kurz, weder vier oder fünf Racen, noch ausschließende Varietäten giebt es auf der Erde. Die Farben verlieren sich in einander ---

And in 1797, in the „Humanitäts=Briefe", he writes:[395]

> Das Urbild, der Prototyp der Menschheit liegt also nicht in Einer Nation Eines Erdstriches; er ist der abgezogne Begriff von allen Exemplaren der Menschennatur in beiden Hemisphären.

He even says:[396]

> Der Neger hat soviel Recht, den Weißen für eine Abart, einen gebohrnen Kackerlacken zu halten, als wenn der Weiße ihn für eine Bestie, für ein schwarzes Thier hält.

Yet in 1766, in an essay on human beauty, he had himself called the negroes „Brüder der Affen",[397] and, in the „Ideen", he said that the Asians of the temperate zone are the ideal human type. But these latter considerations are purely aesthetic, in the tradition of Winckelmann. Günther rightly observes in his history of eighteenth century anthropology that all writers on race at that time believed that some final anthropological classification of races is possible, and adds:[398]

> Die Menge der Einteilungen muß um so mehr überraschen, als man gar nicht leugnete, daß ein wirklich zureichender Einteilungs=grund nicht vorhanden sei. Von denen, die sich eingehend mit diesem Stoffe beschäftigt haben, hat nur einer die Konsequenz gezogen, unter solchen Umständen auf eine Klassifikation ganz zu verzichten: Herder.

Thus, although Herder was prepared to classify races aesthetically, he believed that they cannot be classified anthropologically, since he realised (quite correctly, according to most present-day theorists) that racial

differences in man are only superficial. Thus, those who, during the Nazi era,[399] used Herder's aesthetic classification to suggest that he considered certain races as anthropologically superior to others, were quite mistaken. Even Rouché, who admits in one passage that Herder was no racist,[400] elsewhere says:[401]

> Herder utilise l'ethnologie pour fonder en nature l'orgueil de la race blanche ---

This applies to some extent to his aesthetic tastes, which were fairly classical, so far as human beauty was concerned, as befitted an admirer of Winckelmann and an eighteenth century man of letters, but not to his ideas on ethnographical classification.

Herder probably refused to classify races exactly largely because he distrusted all strict systems of classification. We earlier noticed how he disliked the exact Linnean taxonomy; this dislike was common among those who believed in the Chain of Being, whose divisions were thought to be gradual, and never abrupt. His theory of race was thus much more flexible than Kant's "germ" theory of racial origins and of four clearly separate racial groups.[402] In fact, he explicitly rejects the „Keime" theory of race in his „Humanitäts=Briefe".[403] But it was almost certainly through Kant's lectures on physical geography that Herder first became interested in the problem of race,[404] and it was probably from Blumenbach,[405] Buffon and Camper,[406] and Pallas[407] that he borrowed his notion that the human races have evolved over a period of time under "climatic" influences. Perhaps he derived his idea that colour is not a basic ethnological characteristic from Blumenbach,[408] or from Georg Forster,[409] who supported Herder's theory of race against Kant's "germ" theory;[410] Zimmermann and Meiners, like Herder, believed that white people can become black over a period of time, and vice

versa.[411] From Buffon[412] and Camper,[413] he learnt that the negroes' pigmentation is subcutaneous, and he was probably following Haller[414] when he said, in the „Ideen", of the action of heat upon the lower layers of the negroes' skin:[415]

Es ist ein Oel, womit sie diese Netzhaut färbte.

Such theories at least bear some relation to physiological observations, unlike that of Blumenbach, who said that the bodies of negroes contain excessive carbon,[416] or of those who used the mysterious "phlogiston" to explain dark pigmentation. We may add that Camper, like Herder, held the "organicistic" belief that genetic (or racial) changes to the part also affect the whole of the body.[417]

We conclude that Herder's ideas on race, apart from certain distortions caused by aesthetic predilections, was superior to most contemporary theories, and was founded upon a wide reading. His distrust of rigid classifications, in this case, served him well.

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Having completed our study of Herder's thoughts on the temporal series of living organisms in the earth's past, we conclude that, like most thinkers of his age, he was not an evolutionist. Theology hardly influenced his ideas, except in the question of human origins, and he at times applied a qualified teleology which does not rule out natural causes. His ideas are broadly naturalistic, so much so that, in this section, the metaphysical scheme of the Chain of Being has been little in evidence. He "temporalised" this scheme in a concrete sense only in postulating that organisms were created successively, but not by putting forward a theory of evolution. His ideas are firmly rooted in the empirical observations which were at his

disposal, and his reading was wide and up to date. His beliefs clearly reflect his age and his own personality, and they neither strikingly anticipate those of nineteenth century evolutionists nor do they seem the work of a theologian striving to impose his doctrines upon natural science.

d) The static series of ideal entities: the cosmic hierarchy.

While he did study the history of life in concrete and dynamic terms, Herder continued to believe in the ancient doctrine of an ideal Chain of Being which extends through the observable hierarchy of earthly forms and culminates in transcendental beings. Already in a sermon at Riga he asserts „daß es also wahrscheinlicher Weise in der Reihe der Wesen noch weit mehrere Claßen die uns übertreffen, geben müsse, daß in der Leiter der Vollkommenheit weit mehrere Stuffen über uns stehen, und daß --- wir eine Mittelgattung zwischen Geist und Thier --- sind."[418] Revelation confirms this with descriptions of angels, he adds. In the 1769 manuscript on planetary souls, as we have seen, he says that „viele Götter" exist, although he adds:[419]

> Der Gott, der endlich alles durch Raum und Zeit verbindet,
> der ist Gott.

In a funeral sermon in 1772, he again calls man „das gewagte Mittelgeschöpf zwischen Engel und Thier", saying that many higher beings doubtless exist,[420] and he restates the same doctrine in a poem of the following year.[421] But the most famous utterance of this kind occurs in the „Ideen", where he refers to man as a „Mittelglied", „Mittelring",[422] „Mittelgeschöpf"[423] or „Mittelgattung",[424] and further says:[425]

> Wenn also der Mensch die Kette der Erdorganisation als ihr höchstes und letztes Glied schloß: so fängt er eben dadurch die Kette einer höhern Gattung von Geschöpfen als ihr niedrigtes Glied an ---

He even writes:[426]

> Unsre Brüder der höhern Stufe lieben uns daher gewiß mehr und reiner, als wir sie suchen und lieben können.

Just as he had said in 1769 that one supreme God exists, apart from the „viele Götter" of planets and stars, he later writes in his „Gott" of 1787:[427]

> Gott ist nicht ein Höchstes auf einer Stuffenleiter von Seinesgleichen.

Only on these occasions, and in his two explicit references to angels in sermons in Riga and in 1772, does he allow Christian theology to modify what is basically a mystical and metaphysical Platonic scheme, which had been widely publicised by Leibniz and others.

Herder's name became particularly associated with this doctrine, which he had merely borrowed from an earlier tradition; Tolstoy refers to it as an idea of Herder's in his "War and Peace".[428]

However, we are here discussing the ideal Chain of Being. And we know that Herder always used „Kräfte" to link real and ideal worlds. But „Kräfte" are dynamic, not static, so that we are now led to examine his more usual application of the ideal series of forms, whereby he treats it no longer as a static sequence of beings, but as a dynamic progression of „Kräfte".

e) The dynamic series of ideal entities: immortality, metempsychosis, palingenesis and planetary habitation.

The first chapter of Book V of Herder's „Ideen" carries the following title:[429]

> In der Schöpfung unsrer Erde herrscht eine Reihe aufsteigender Formen und Kräfte.

We have already seen, in examining Herder's writings on biology, how he treats the "forms" he mentions. But like Leibniz, he introduced an ideal and dynamic element into the Chain of Being by saying that a „Kraft" exists behind every form. This scale of „Kräfte" is thus exactly parallel to the visible Chain of Being, although it stretches on into the transcendental world as well. As Lovejoy remarks, Bonnet, and even Addison had put forward similar interpretations of the Chain of Being, which are both ideal and dynamic or "temporalised".[430)]

Kronenberg[431)] and Kühnemann[432)] maintain that Herder introduces this series of „Kräfte" simply in order to show that the visible Chain of Being is not fortuitous, but can be justified teleologically. But this is only part of his reason. He introduces this ideal, dynamic series above all in Book V of his „Ideen", where he uses it chiefly in order to demonstrate that the soul is immortal. To analyse this conception is therefore to find out his answer (or rather answers, for he presents several different solutions, as usual) to the problem of immortality. But since <u>all</u> „Kräfte", not only those of human souls, are indestructible, it is immortality in the widest sense, including that of animal "souls", which is at stake. For all visible natural forms are merely „<u>eine</u> Leiterin derselben [i.e. „Kräfte"] zu einer höhern Bildung".[433)]

As Haym points out, Herder was no longer satisfied with the orthodox Christian teachings on the afterlife in his mature and more liberal period.[434)] He set out to provide philosophical proofs of the afterlife, although, as Haym observes, he had himself questioned Moses Mendelssohn's "proofs" of immortality before he entered upon his religious phase in Bückeburg.[435)] R. Unger has done much to elucidate these varied developments in Herder's

theories of the afterlife,[436] and Pamp has recently added to the literature on this subject.[437] More than any other critic, Unger has understood how complex Herder's ideas on this question are, and he notes that science, the philosophy of history, ethics, emotion, psychology and mystical speculation all enter into them.[438]

But even in his mature period some of Herder's old scepticism remained. He speaks with confidence about the various modes of immortality which all „Kräfte" enjoy, but he does sound a note of doubt at times. For example, he says in the „Ideen":[439]

> Und wohin kehren diese geistigen Kräfte, die allem Sinn der Menschen entgehen? Weise hat die Natur hier einen Vorhang vorgezogen und läßt uns, die wir hiezu keine Sinne haben, in das geistige Reich ihrer Verwandlungen und Uebergänge nicht hineinschauen.

He later admits in the same work:[440]

> Der Mensch also soll in seinen künftigen Zustand nicht hineinschauen, sondern sich hineinglauben.

Kant, in his review of the „Ideen", Part I, was prepared, in accordance with the old Platonic doctrine, to concede that a series of ideal beings may exist.[441] But, just as the young Herder had maintained when criticising Mendelssohn's „Phaedon", he says that we cannot prove that beings on one level can ascend to a higher one. Even in his early and more sanguine „Allgemeine Naturgeschichte", he had adhered to the old <u>static</u> conception of the ideal Chain of Being, only adding that man may <u>perhaps</u> visit higher worlds some day.[442] At that time, he had indeed believed that progressively more perfect ideal beings on other stars and planets are <u>created</u> successively, but he never temporalised the ideal series in the way that Herder did in his

"proofs" of immortality. As we shall see, Herder involved himself in serious difficulties as soon as he said that beings on one level of the Chain may ascend to higher levels. In answering this problem, he offered basically three solutions. These were the theories that „Kräfte" may ascend by metempsychosis, by palingenesis, or by being assimilated by other higher „Kräfte". Let us review these three hypotheses in turn, as aspects of Herder's ideal evolutionism, before we conclude this chapter with some remarks on the idea of planetary and stellar habitation.

(i) Metempsychosis.

Rouché declares that Herder's alleged "Darwinism" consists only in the doctrine of metempsychosis, which many earlier critics had misinterpreted in concrete terms.[443] Unger, however, gives a list of men who believed in true metempsychosis, including Lessing, Schlosser, the young Schiller, and Goethe, but not Herder.[444]

The disagreement between these two critics is really only over the use of the word "metempsychosis", it would seem. Metempsychosis usually denotes a belief that the souls of men, or of lower creatures, enter after death into new bodies, of either higher, lower or the same living species, but always on this earth.

It is well known, however, that Herder, in his „Gespräche über die Seelenwanderung" of 1785, rejects the idea that men may return to this earth after death.[445] And in 1797, he impugned the cyclic or regressive metempsychosis of the Pythagoreans and Hindus, which taught that souls may return to lower bodies on this earth for punishment; he calls this „ein häßlicher und verächtlicher Gedanke".[446] Nevertheless, his belief that animal „Kräfte" may ascend to the human level when their former bodies are dissolved at times appears very akin to metempsychosis, especially when he says, in an

early notebook:[447]

> Ich bin ein Thier gewesen.

The singular number „ein" implies that the identity of the animal soul is conserved in its later existence, as in the doctrine of metempsychosis; yet Herder's more usual theory that lower „Kräfte" are assimilated by higher ones, as we shall see, does not involve conservation of identity. Frau von Stein, in a letter of 1784 to Knebel, quoted by Haym,[448] says that Herder believes „[daß] wir erst Pflanzen und Thiere waren". This is another instance of metempsychosis, it seems, although Frau von Stein may simply have misunderstood Herder's doctrine that plant and animal „Kräfte" are assimilated by higher „Kräfte" such as those of man, as he propounds it in the „Ideen", or perhaps as she had heard it in conversation with him. But he writes in a similar tone of the bee in 1783 or 1784:[449]

> Vielleicht war sie einmal eine Blume --- in einer andern Organisation wird sie auch eine andre Sphäre zu wirken haben.

But such utterances are exceptional, and we cannot say that Herder was a complete believer in metempsychosis, since he rejected it when applied to man, and in its cyclic and regressive forms.

(ii) Palingenesis.

Herder and his critics usually apply the word „Palingenesie" to the development of the human soul in particular. Sometimes it involves the regeneration of the soul in a new, higher body elsewhere in the universe (and is therefore linked with theories of planetary habitation), and sometimes an inward regeneration of the soul in this life, as in Goethe's idea of „Stirb und werde". In both cases, the soul remains associated with a body, for every „Kraft" must have its „Organ", as Herder so often maintains. (As

Rouché shows, this doctrine differs from orthodox Christian teachings on immortality in at least five important respects.[450])

One of Herder's earliest utterances on palingenesis appears in the 1769 manuscript on planetary souls, where he asks with reference to death:[451])

> Was thut meine Seele? sie bleibt im Universum: --- sie fängt gleich an, sich wieder einen Körper zu bauen. Wo? wie? in welcher Zeit? von welcher Gestalt? Das ist die Frage?

He adds a little later:[452])

> Menschliche Seele ist wesentlich von andern verschieden. Mensch bleibt Mensch.

In the letter of that same year to Mendelssohn which Unger has published, he says that the human soul must be reborn as a human soul, with a body, if it is to be reborn at all.[453]) But it is not clear once again <u>where</u> this regeneration takes place; if he means that it occurs on earth, he is clearly advocating that very metempsychosis which he later rejected. Since there is no evidence for the latter inference, we must assume that he believed that the soul is regenerated on some other world within the universe. Thus, he suggests in the „Ideen", as we shall see, that the human soul ascends after death to a higher existence on some other cosmic world, but in a new „Medium" (i.e. body). In his „Gespräche über die Seelenwanderung" of 1785, he says more cautiously that true palingenesis is the regeneration of the individual man in <u>this</u> life, and that a higher but unknown palingenesis doubtless occurs after death too.[454]) And in 1797, when his religious beliefs no longer included any seriously transcendental or supernatural elements, but virtually coincided with his ethical ideal of „Humanität", he writes:[455])

> In diesem Leben ist also den Menschen Palingenesie, Metempsychose unentbehrlich; oder sie ist überhaupt mißlich.

He does not even trouble to distinguish between the two words here, since he is no longer concerned with their metaphysical significance.

From what sources did Herder derive such ideas? As Unger and Pamp have shown, Bonnet, with his "palingénésie" and "ethereal" body of the afterlife, was certainly a major source. Unger also points out that Leibniz believed that the soul requires a new body in the future existence.[456] We may also conjecture that Needham's belief that polarised forces create and develop the embryo perhaps influenced Herder's idea that the soul cannot exist without a body, which it creates for itself by attraction and repulsion.

(iii) The assimilation of lower by higher „Kräfte".

We now come to the least discussed but most interesting of Herder's theories of ideal development or evolution, the theory of progress by assimilation.

While the few passages in Herder's works which suggest metempsychosis, and all of those which deal with palingenesis, imply that the ascending soul conserves its personal identity, the theory of assimilation does not. The „Kräfte" of organisms lower than man, he often shows in the „Ideen", can ascend only through being assimilated by higher ones. He thus concludes that „jede Zerstörung ist Uebergang zum höhern Leben".[457] He also says more explicitly:[458]

> Der einzige Elephant ist ein Grab von Millionen Kräutern; aber er ist ein lebendiges, auswirkendes Grab, er animalisirt sie zu Theilen seiner selbst: die niedern Kräfte gehn in feinere Formen des Lebens über.

And, in the „Gespräche über die Seelenwanderung" of 1785, he writes:[459]

> Das Reich der Thiere, unsrer stummen Mitbewohner, zerstört tausend Formen niedrigerer Art, um seine höhere Formen zu beseelen: der Mensch endlich, der größte Ausarbeiter und Zerstörer der Schöpfung, --- er ist ohne daß ers weiß, das Ziel seiner niedrigen Mitbrüder, nach dem sie vielleicht alle unvermerkt geführt werden.

Similar utterances already appear in works of 1777[460] and 1778.[461]

As Rouché says, beings lower than man can thus ascend only by becoming the food of higher ones,[462] and Siegel remarks that this is one instance where Herder does suggest that a <u>real</u> kind of animal "evolution" occurs.[463]

But two things in particular strike us about this doctrine of Herder's. Firstly, it necessarily involves the loss of individual identity with death, and secondly, it is applied only to beings lower than man, who does retain his identity in „Palingenesie". Now there is no way of logically justifying this abrupt distinction between man and lower beings by the metaphysical scheme of a gradual series of forms or „Kräfte". The logical conclusion to be drawn from the doctrine of assimilation would be that man too, and other higher beings ascend and lose their identity through being assimilated by beings whose nature is higher still than theirs. Dr. Johnson satirised Soame Jenyns' interpretation of the Chain of Being since it implied, more logically than Herder's, that the torments of lower beings minister to the well-being of higher ones throughout the whole series.[464]

It is not at all remarkable that Herder <u>did</u> clearly hint at this sinister implication in another of his writings - in the 1769 manuscript on planetary souls which Irmscher published. He says of the earth's „Genius":[465]

> --- der Genius hört auf mich so wenig als ich auf das Schreien eines Wurms! Er ist zu groß dazu: --- Er hat mit sich so zu thun, wie ich mit mir, ohne daß ich den Wurm höre wenn ich gehn will und ihn zertrete.

Nemo contra deum nisi deus ipse, Herder seems to imply here. The same idea recurs in an early manuscript for the „Ideen", already quoted earlier, in which he says that the human soul merges with the „Meer der Gottheit" after death.[466)]

But another way of solving this problem is to suppose that individuals of sufficient "greatness" may retain their identity after death. Herder hints at this idea, strangely enough, in a sermon of 1775:[467)]

> - der Ruhm, der in mir ist, das Gefühl thätiger Kräfte, die ich mir auch aus mißlungenen Versuchen gesammelt, muß mir, wenn gleich mein Leib in Trümmer versinckt, doch bleiben --- meine Werke werden mir nachfolgen.

Goethe boldly accepted the consequences of this truly daemonic conception:[468)]

> Wer keinen Namen sich erwarb, noch Edles will,
> Gehört den Elementen an; ---

Herder, in 1797, quotes a passage from Dow's "History of Hindostan" which, in a more ethical setting, is parallel to Goethe's words:[469)]

> Aber die Seelen derer, die Böses thun, werden im Tode von den Elementen nicht befreiet.

A further implication of Herder's theory of progress by assimilation is that the „Kräfte" or souls of those animals which are not eaten by higher creatures or by man must surely also return to the "elements" or become assimilated by <u>lower</u> creatures than themselves, such as worms. And those of which only portions are eaten must surely ascend only in part. However,

he was either unaware of these difficulties, or did not choose to grapple with them.

Let us add some notes on sources and on similar ideas in the works of others. Needham had said of the polarised "forces" which create and sustain animal organisms:[470]

--- elles assimilent ou sont assimilées.

(We also noticed in an earlier chapter how important the idea of assimilation was in mysticism, in magnetic theory, and in some other areas of biology.) Unger observes that Christian Wolff distinguished between the "indestructibility" of animal souls and the "immortality" of the human soul.[471] This is precisely equivalent to Herder's distinction between animal "assimilation" and human "palingenesis", although Herder avoids making the distinction explicit. For although he declared on several occasions, as we noticed in our section on teleology, that no link in the Chain of Being is less important than any other, a hidden difference between the lot of man and of the animals is implied. That is, the „Kräfte" which supposedly exist in all beings are basically of two distinct kinds. Those of the animals, in the theory of "assimilation", are not generically different from the traditional concept of matter, although Herder would never have admitted this, and those of human souls are really equal to the traditional concept of mind or spirit. This latent dualism becomes apparent when Herder admits that man is a „Mittelgeschöpf", compounded of two natures. This is, in fact, a concession to the traditional dualism which the „Kraft" idea was designed to circumvent.

Thus, all „Kräfte" are immortal, but some are more immortal than others. It is clear that the animals, with their humbler "immortality" reached only through the digestive systems of higher creatures, are treated quite differently from man, and really only minister to his needs. Herder did

not admit this teleological and anthropocentric consequence of his ambivalent theory, which he had, in all fairness, avoided in his writings on pure biology, but which comes out clearly in his attempts to "prove" immortality. Steering his way between the logical alternatives of avoiding teleology, as he did in 1769, by suggesting that man may be destroyed or assimilated by higher beings (or that he may lose his identity in the "elements"), and of avoiding such grimmer conclusions by presenting the Chain of Being in terms of anthropocentrism, teleology and theodicy, he pledged himself fully to neither, and used elements of both, thus relapsing at times into traditional dualism. Once again, the „Kräfte" which are supposedly shared by the animals, man, and the immortal souls of higher beings enabled him to bridge over a hidden dichotomy, but only superficially.

All of these ambiguities arise not out of Herder's attempts to apply orthodox theology to science, but out of his wish to prove his completely unorthodox idea of personal immortality through "palingenesis" by means of the old metaphysical and mystical doctrine of the Chain of Being, particularly in the dynamic form which Leibniz (and Bonnet) had given it. This, as Lovejoy says, was the beginning of that "temporalisation" of the Chain of Being, which, when related to the empirical data of palaeontology, etc., prepared the way for the modern theory of evolution by descent. It is not surprising that many later critics, not sufficiently familiar with this time-honoured and all-embracing scheme within which <u>several</u> kinds of "evolution", empirical <u>and</u> ideal, could be conceived, should have mistaken many of Herder's statements on dynamic but ideal processes for early formulations of the Darwinian theory of evolution, although they cannot be excused for ignoring Herder's clear rejection of the theory of evolution by descent in other parts of his work.

(iv) Theories of planetary or stellar habitation.

Already in the unpublished „Anfangsgründe der Sternkunde" of 1765, Herder says that the moon is probably a body like the earth, and adds:[472]

> --- aber seine Geschöpfe können von gantz [sic] anderer Art seyn als wir.

In the „Ideen", he returns to this theme, but first of all admits that the speculations of Kircher, Swedenborg, Fontenelle, Huygens, Lambert and Kant on the inhabitants of other worlds simply prove, „daß wir davon nichts wissen können, nichts wissen sollen", because „wir --- haben kein Maas der Ver= gleichung".[473] But such misgivings do not deter him from echoing Kant shortly afterwards, and saying „daß es endlich vielleicht gar unsre Bestimmung wäre, mit allen zur Reife gelangten Geschöpfen so vieler und verschiedener Schwesterwelten Umgang zu pflegen."[474] In the „Metakritik" of 1799, he writes of „die allerdings wahrscheinlichen Einwohner" of some of the other planets around the sun.[475] In 1802, in the „Adrastea", he still believes that other worlds may be inhabited, but now qualifies this, mindful of the observations recorded by Herschel, Schröter and others, concerning the moon's barren surface, by saying that they may not all be equally habitable.[476] He says that the moon may formerly have been habitable,[477] but soon afterwards, as we have seen, he takes exactly the opposite view that it may gradually be developing towards a state where life will emerge upon it, under the influence of the vivifying „Äther".[478] This "evolu- tionary" approach to astronomy at once recalls Kant's „Allgemeine Natur= geschichte", of course, but Herder no longer acknowledges his debt to his old teacher.

Alongside this general conviction, shared by many thinkers (and indeed

astronomers) of that age, that other worlds are inhabited, there appears the more particular and dynamic theory that beings from this world ascend, after death, to higher worlds. More specifically still, Herder seems to have been influenced by the ancient Platonic belief that increasingly perfect beings are found towards some cosmic centre, whether the centre of the actual universe or merely of the invisible universe of the spirit, and that all creation aspires towards the central focus, the divinity. (In this old mystical doctrine, we can already discern the germ of that "temporalisation" of the Chain of Being which developed more fully in that progress-loving age, the eighteenth century, after Leibniz had set it going again.) We have seen how Herder employs this idea of a universal centre by applying the analogy of gravitational fields to man's moral situation. Besides, we noticed that he disagreed with Kant's early theory that perfection increases away from the centre, and that he seems to have preferred the older, opposite idea that perfection or progress converges upon a universal centre.

In the manuscript „Anfangsgründe der Sternkunde", we already find him speculating about the probable centre of our galaxy, the Milky Way.[479] In the „Ideen", he mentions Bode's hypothesis that the "planetary" surface of the sun, beneath a surrounding envelope of light, may be habitable.[480] (In our section on light-theory, we noticed how much this idea interested him in later years.) But in his „Gespräche über die Seelenwanderung" of 1785, he enunciates his theory of progress towards a cosmic centre more clearly than on any other occasion, and refers unambiguously to the actual universe, and not to any invisible, symbolic world of the spirit:[481]

> Vielleicht sind uns auch Ruheörter, Gegenden der Zubereitung, andre Welten bestimmt, auf denen wir, wie auf einer goldenen Himmelsleiter, immer leichter, thätiger, glückseliger, zum Quell alles Lichts emporklimmen, und den Mittelpunkt der Wallfahrt, den Schoos der Gottheit, immer suchen und nie erreichen.

He further conjectures, „daß vom letzten Planeten bis zur Sonne hinauf es Gradationen der Geschöpfe, wie des Lichts, der Entfernung, der Massen, der Kräfte gebe, setzen Sie die Sonne nun als den grossen Versammlungsort aller Wesen des Systems."[482] Already in a sermon in 1781, he had referred to the earth as „nur ein Ruheplatz, eine Wanderstäte [sic]".[483] And, in an undated poem written sometime in the 1780's, he writes:[484]

> Sieh umher, die sieben Sterne
> sind Ruhestäten für den Wandrer nur
> der in sein Vaterland, die Sonn' hinaufeilt!

From all this, it seems that he associated the sun with the highest cosmic throne of the divinity (although we have seen elsewhere that he believed the supreme God is superior to all the deities of planets, etc. Compare the above passage where he says that we "always seek" but "never reach" the divinity.) Not surprisingly, he says that sun-worship is „begreiflich" in the 1769 manuscript on planetary souls, as we earlier remarked.

As for the sources of these ideas, the belief that there is a divine centre of the universe towards which creation strives is almost certainly borrowed from Thomas Wright (ultimately from Platonism), whom Kant mentions and refutes in his „Allgemeine Naturgeschichte". As Kant points out, Wright believed that God acts from the centre of the universe, attracting virtue and repelling vice.[485] No doubt this also influenced Herder when he used the gravitational analogy to describe man's ethical position. He actually writes to Lavater in 1772, recommending Kant's „Allgemeine Natur=geschichte", „wo Sie sogar Ihre Mittelsonne [Lavater had indulged in similar mystical speculations] finden, die auch ein Engländer [i.e. Wright] ordentlich astronomisch behauptet hat."[486] It was thus from Kant and Wright that Herder derived the notion that the actual universe is the scene of an ideal "evolution" towards higher worlds. To the more abstract and

ethical, but astronomical pattern of Wright, he added his own theory, in turn influenced by Leibniz and Bonnet, that a dynamic progress by psycho-physical "palingenesis" occurs in the upper half of the Chain of Being.

Among the numerous writers Herder names throughout his works, there are many who likewise believed that other worlds are inhabited (if not that we actually ascend to some of them after death). Siegel names Kant, Lambert and Fontenelle[487] among these, and Rouché names Bode, Bonnet and Martinet.[488] We may add to these Herschel,[489] Ray,[490] Campanella,[491] Bruno,[492] Kepler,[493] Edward Young,[494] Leibniz,[495] Bentley, Whiston, Derham and Burnet,[496] and even then this list is by no means complete.

Apart from Herder's personal belief in a dynamic inter-planetary sequence of beings (which Kant had qualified even in his „Allgemeine Natur=geschichte"), with ethereal bodies, progressing up a ladder of existence towards a central sun, we can say that his ideas on this subject were thoroughly typical of his age. Teleology, as we noticed when discussing it, required that all celestial bodies must have a purpose, which is either to give light to other (inhabited) bodies, or to sustain living inhabitants on their own surface. The Chain of Being conception also posited a plenary universe. Moreover, the eighteenth century was an age which delighted in Utopias, whether they took the form of a past Golden Age, a future millenium, or of some unspoiled, undiscovered land peopled by noble savages. (Such ideas also appear in Herder's writings, of course.) Thus the belief that other worlds are inhabited, although fairly common even around the Renaissance, became very widespread in Herder's age, since it appealed enormously to the century's peculiar kind of imagination, even although it had been anathematised by orthodox theologians as incompatible with the dignity of man, who was created in God's image, with the Incarnation

of Christ as the Son of God, and with the absolute and final validity of His mission of Redemption.[497)]

Conclusion.

It has seemed necessary to give a comprehensive account of Herder's views on the Chain of Being, because it is within this typically eighteenth century context that his "evolutionary" ideas are set. It should now be evident that he was neither a Darwinist nor a theologian who was bent upon interpreting the phenomena of life in terms of religious orthodoxy. He was a religious man, but his religion, at the time of the „Ideen", was a liberal one, and it is only one element within his wide and varied learning and thought. In his attitude to the hierarchy of living forms and their development in time we encounter that characteristic blend of naturalistic and metaphysical or idealistic modes of explanation which is so characteristic of Herder's thought, especially in his mature years. Both modes coexist uneasily in his writings, and we again insist that it is wrong to emphasise one at the expense of the other, since it was his very nature to use them both, and to try to reconcile them, even distorting them both in the process. It was this feature which made his thought rich and stimulating to others, as well as ambiguous and even contradictory in itself.

C H A P T E R III

The Human Sciences.

In our chapter on biology, we touched upon certain aspects of the human sciences, since they were closely bound up with the problem of biological evolution in general. Such were the questions of the origin of man, the evolution of the human races, and the relative influences of heredity and environment upon the human constitution. We shall now deal with the remaining branches of the human sciences as they are represented in Herder's writings.

1. Physical anthropology: the physical characteristics of man in relation to the other animals.

Since we have already examined Herder's ideas on the physical differences between the human races, the only branch of physical anthropology which remains to be studied is that which treats of the physical differences between man and the other animals. Certain general aspects of this problem have already been discussed, and need not be reviewed again here. Such were Herder's relatively modern criteria, mentioned in our sections on classification and the "levels of organisation", for distinguishing between organisms according to degrees of physical complexity rather than to qualitative or intrinsic differences (although he employed qualitative „Kräfte" as an alternative distinction, as we also observed).

In the present section, we shall be concerned with psychological distinctions which Herder draws between man and the other animals only in so far as they are related to observable physical differences. However, we may here briefly review the other more or less psychological criteria which

he uses at various times. These include the human power to communicate by language,[1] perfectibility[2] („das Gesetz der Vervollkommnung"), „Besonnenheit",[3] and sociability or social altruism,[4] all of which he names, especially in his early essay on language, as peculiarly human characteristics. With reference to these, we may note firstly that the criterion of language, of course, still remains a perfectly valid distinction between man and the animals, and the power of speech, as Herder also realised, is related to certain characteristics of the vocal chords, etc., in man. Secondly, it is worth mentioning that Rousseau had used the criterion of perfectibility before Herder as a distinction between man and the apes, although he believed that the orang-outan, unlike the other higher apes, is fundamentally the same as man.[5] Perfectibility, or the ability of the human mind to develop progressively, is a valid criterion if considered as a difference in the degree of complexity of mental functions, and when related to man's power of language, hence of rapid and cumulative learning. Thirdly, we shall return to the idea of „Besonnenheit" or of a "sensorium commune" in man in our section on faculty psychology, and fourthly, we may recall that human sociability was mentioned in connection with the problem of perception, and the supposedly social tendencies of insects etc. in our section on classification.

Religious or metaphysical criteria, such as that of the immortal soul or of a special human providence, have been mentioned in our sections on "ideal" evolution and on the problem of teleology. We also referred to similar qualitative distinctions in terms of „Kraft" in our section on classification, where we noticed that, in the „Ideen", in which Herder's theories of physical anthropology appear in their most developed form,

qualitative criteria such as „Kraft" play a smaller part than formal and genuinely empirical distinctions. It is these empirical distinctions between man and the other animals, as they appear in Herder's mature period, which we shall now discuss.

Eighteenth century thinkers were particularly interested in the differences between man and the other animals, especially the apes. This interest was part of the current vogue of "primitivism", which was itself encouraged by the discovery of various backward, but apparently idyllic communities on Pacific islands and elsewhere. Rousseau's works further helped to foster this interest, and Nature Utopias figured prominently in the literature of the age. Besides, the Leibnizian principle of continuity (itself derived from the ancient doctrine of the Chain of Being) taught, as Lovejoy observes,[6] that transitions between natural forms, including that between man and the apes, are invariably gradual. From this premise, it seemed likely that undiscovered "missing links" might exist somewhere between the apes and man.[7] Indeed, legends of ape-men, satyrs, boys suckled by wolves, and the like, not uncommon in antiquity, show that such beliefs were by no means new. But, for the reasons we have named, they were particularly popular in Herder's age. All varieties of apes, "noble savages" from distant and uncivilised lands, "porcupine men" (and similar cases of genetic atavism), "wild boys" long separated from human society, and other human freaks of all kinds, were studied by educated men with zealous attention. Anyone patronising such prodigies was assured of immediate celebrity, until, with the advance of science and the decline of primitivism, they eventually found their place in scientific textbooks for the learned, and in fair-grounds for the curiosity of the vulgar.

Already in his essay on language in 1770, Herder discusses cases of

"wild men" who, abandoned by society, had reverted to an animal state. But here, as later in the „Ideen", he emphatically maintains that they are only degenerate men, and that man can never completely lose the peculiar identity of his species.[8] Similarly, he is sceptical from the start about legends of "tailed men" or ape-men, still widely accredited in his day. As early as in 1766 he doubts the existence of the fabled "tailed men" of Borneo, and remains incredulous regarding the theories of the eminent scientist Maupertuis, who firmly believed that such creatures exist.[9] Herder rightly exclaims:[10]

> --- alle diese Nationen gehören zu den Kaklogalliniern, Liliputtern und Huynhuyms, in die Welt, die Swift erschaffen.

Among those writers known to Herder who did believe that "tailed men" or ape-men existed, that apes could be taught speech and become like men, or that men could revert to ape-like states, were Rousseau, Lamettrie and Voltaire,[11] Linnæus,[12] Moscati,[13] Bolingbroke,[14] Maupertuis,[15] and Monboddo;[16] even Kant, in his lectures on physical geography as they were published in 1802, declared:[17]

> Die mit einem kleinen Ansatz von Affenschwanz versehenen Menschen auf Formosa, im Innern von Borneo u.s.w. --- scheinen nicht ganz erdichtet.

Robinet, in the 1760's, went so far as to claim the existence of mermen.[18]

On the other hand, such fanciful theories and legends were rejected by others whose works Herder had read; such were Blumenbach, who rightly believed, on scientific grounds, that the "tailed men" were only apes,[19] and Camper, who said on the strength of his dissections that negroes are basically the same as Europeans, and that apes are physically incapable of speech.[20] Tyson, the noted British anatomist, whom Herder also cites,[21]

had already maintained in 1699 that the fabled ape-men, satyrs, etc. of the ancients were all merely apes;[22] he added the following telling observation:[23]

> This Difference I cannot but remark, that the Ancients were fond of making Brutes to be Men: on the contrary now, most unphilosophically, the Humour is, to make Men but meer [sic] Brutes ---

In other words, Tyson had witnessed the beginnings of the modern fashion of primitivism, possibly in the works of writers such as Hobbes, who portrayed "natural man" as little better than a brute. It is clear from his words that he realised that such theories are fashions, the offspring of the temper of the age, rather than scientific hypotheses based upon genuine observations. We may add that men like Rousseau and Monboddo, who believed in the eighteenth century that orang-outans are capable of acquiring speech and becoming civilised, and that our ancestors were orang-outans, should hardly be regarded as scientific thinkers or as precursors of Darwin. They were usually apostles of primitivism, led by their distaste for the rationalistic worship of progress to mount far-reaching attacks upon modern civilisation and to glorify the supposed "natural" or animal state of man.

However, Herder denied that man and the apes are fundamentally identical, and that the one can become the same as the other. His grounds for saying this were scientific, to judge by the writers, such as Blumenbach, Camper, and Tyson, whom he cites in the „Ideen". His earlier doubts, in 1766, concerning "tailed men" etc., before he read these authors, were probably inspired by that general scepticism regarding legends and miracles which he exhibits throughout his first period as a writer.

We must now examine in detail how Herder differentiates between man and

the other animals, particularly the apes. In the „Ideen", he suggests several criteria upon which such a distinction may be founded. For example, he rightly says that a larger brain is a necessary condition, but not the only one, for a superior intelligence such as that enjoyed by man.[24] But we have already seen, in our sections on the animal "type" and on comparative and analogical methods, that he believed all animals, including man and the apes, to be basically similar, especially in their anatomy. This notion, as he elaborated it in the „Ideen", made it necessary for him to show that whatever differences do exist between animal species, including man and the apes, are rather differences of degree or form than of kind or intrinsic quality (although we have seen that he also retained, to some extent, his older metaphysical and qualitative distinctions in terms of „Kräfte", the immortal soul, etc.). However, the principal difference between man and all the other animals is one of form, he contends in the „Ideen". It is the difference between man's distinctive upright posture and the horizontal posture natural to the quadrupeds. He believes that all man's superiorities over the animals, including his freedom of will, his ability to produce artifacts, his reason, his perfectibility, etc., can be derived from this physical peculiarity.[25]

This idea is not original to Herder, however. Buffon had said that the ape is four-handed, and man two-handed.[26] Helvétius, whom Herder mentions in connection with such theories, had emphasised the importance of man's two hands for his rational abilities, since the upright human posture leaves the hands free to perform purposeful tasks.[27] (This is still a favourite anthropological axiom.) Zimmermann also believed that man's gait is naturally and characteristically upright,[28] and Daubenton, with whose

contributions to Buffon's "Histoire naturelle" Herder was acquainted, showed that various of man's anatomical peculiarities are related to his upright posture.[29)]

However, the Italian Moscati had declared (1770 and 1771) that man was formerly and naturally a quadruped, but that he assumed the erect posture at the time of Adam's Fall from Grace; Moscati regarded this as a curse, as the root of all man's miseries and afflictions. Herder explicitly mentions Moscati and his theory, with which he naturally disagrees, in the „Älteste Urkunde",[30)] but Kant had earlier composed a favourable review of this unusual work.[31)] Rouché points out that J.C. Mayer, in a work of 1783 which Herder read, refuted Moscati's hypothesis.[32)] We may add that Blumenbach, like Herder, also declared that any observer "will not but see that a bipedal brute and a quadrupedal man would equally pass for prodigies",[33)] and that the present gaits of man and the animals are perfectly natural. It is strange that although Kant had favourably received Moscati's suggestion that man's present ethical situation is linked to his upright posture, he rejected Herder's much less fanciful theory that man's reason is linked to his characteristic bearing, when he reviewed Part I of the „Ideen".[34)] We can only conclude that Kant probably still sympathised with the Rousseauistic belief that man has degenerated from some earlier "natural" state, and that his present characteristics, such as his upright posture, should not be regarded as unqualified advantages.

Georg Forster offered a more telling objection to Herder's explanation of man's superiority. He writes of it to Sömmering as follows:[35)]

> Das nenne ich aus menschlichen Begriffen allegorisirt. --- Tragen denn nicht alle Vögel den Kopf in die Höhe; am meisten die allerdümmsten.

However, Hansen has shown that Herder's theory of man's superior mental ability can be reconciled with later scientific observations. He quotes an article on human evolution as follows:[36)]

> Es kann schon aus rein statischen Gründen kein Zweifel darüber bestehen, daß für die mit zunehmender Hirnentwicklung parallel laufende Vergrößerung des auf der Wirbelsäule balancierenden Schädels die Aneignung der dauernd aufrechten Körperhaltung die natürliche Voraussetzung gebildet hat.

We can also reply to Forster's objection by pointing out that the erect position of the bird's head does not leave free two limbs which can be adapted to handling objects and tools as does the upright posture in the case of man.

Nonetheless, we can readily admit that Herder did tend to exaggerate this particular feature of human anatomy, linking it to „Humanität" and at times displaying a thoroughly anthropocentric pride in man's superiority. But his main fault was that he failed to include further evolutionary and physiological preconditions of man's abilities in his theory. This occurred firstly because he rejected the idea of evolution, and lacked an adequate knowledge of man's evolutionary development, and secondly, because, as we shall see, he did not make sufficient use of data concerning the physiology of the brain.

Rouché admits that the ancients had generally considered man's upright posture to be a distinguishing advantage, just as Herder does, yet he contends that Herder's theory is really of Christian inspiration.[37)] To this we would reply that Herder's view was shared not only by the pagans of antiquity, but also by such freethinkers as Helvétius, and that he supported it with evidence culled from the works of such eminent scientists as Buffon, Daubenton and Blumenbach. Besides, Moscati's theory, which Herder denounced,

associated man's upright posture with the doctrine of original sin, and was accordingly far more influenced by theology than was Herder's. For Herder's pride in man's excellence is more typical of the humanism of antiquity, the Renaissance and of eighteenth century rationalism than of orthodox Christianity, which tended to dwell upon man's shortcomings rather than upon his grandeur. As Lecky puts it:[38)]

> It is impossible to look upon the awful beauty of a Greek statue, or to read a page of Plutarch, without perceiving how completely the idea of excellence was blended with that of pride. It is equally impossible to examine the life of a Christian saint, or the painting of an early Christian artist, without perceiving that the dominant conception was self-abnegation and self-distrust.

Herder employs a further technique in distinguishing between man and the animals. As Rouché notices, he borrows Camper's idea that the craniological angle between two lines, one drawn from the ear to the base of the nose, the other from the prominence of the forehead to the front of the jaw, is greatest in man, especially in the European races.[39)] Herder further suggests that angles between four lines, drawn from the uppermost cervical vertebra to the rear of the head, the crown of the head, the front of the forehead and the chin respectively, should also be compared in different animal species and man. (These additional measurements of the skull were probably suggested by some remarks of Blumenbach, Rouché declares.[40)]) We may say that such methods can be useful as rough guides to craniological types, but they are too subject to variables to be accurate,[41)] and they can become dangerous if used as a basis for value judgements, especially in the question of racial superiority, as indeed occurred in more recent times. But, as A.C. Haddon notices in his history

of anthropology, Camper regarded it primarily as an aesthetic criterion, not an anthropological one.[42] Herder himself does not use it to pass judgement on the intrinsic merits of racial types either. But it is of particular interest to us, since it again shows that, in the „Ideen", he was increasingly favouring formal rather than qualitative distinctions between different species, in keeping with his growing interest in comparative anatomy, and that methods involving verifiable measurements were supplanting his earlier interest in physiognomy, with its divinations of intrinsic qualities.

We conclude that Herder's theories of physical anthropology were not characterised by theological overtones, and that their limitations arose rather from Herder's having no theory of evolution than from his not having availed himself of such empirical evidence as was available at the time. We have also seen that he increasingly used formal and visible criteria rather than qualitative or "physiognomical" ones. His theories were, on the whole, typical of the more advanced anthropological ideas of his day, and they are particularly remarkable for their healthy scepticism regarding both time-honoured legends and the myths of contemporary primitivism.

2. Medicine.

A few words must be said on Herder's knowledge of medicine, since it was in this subject that, with the encouragement of his early patron, the army-surgeon Schwartz=Erla, he at first intended to make his career, until, overcome at the prospect of a dissection, he altered his plans.[43] He continued to show interest in the subject throughout his life, however, and several of his associates were members of the medical profession, from the

student Pegelow in Straßburg, to J.G. Zimmermann, physician in ordinary at Hannover,[44] and, at a later date, his own son Gottfried. His interest was probably stimulated by his own frequent illnesses, and his letters, as well as those of Caroline, contain unnumbered references to illnesses and states of health. In his writings, he mentions such medical authorities as Hoffmann of Halle,[45] Boerhaave,[46] Sydenham,[47] Gaubius[48] and Unzer.[49] Caroline says that he read and admired the works of the physician Leidenfrost,[50] and excerpts from the medical writings of Metzger, J.C.A. Mayer,[51] Prochaska, Meier, Gruner, Sydenham and Caldani are found in his unpublished notebooks.[52] His library also contained medical works by Baader, Heister and Culmus,[53] as well as various works on human physiology, etc., mentioned elsewhere in our present work.

However, all this is evidence of Herder's wide reading in all subjects, including all of the sciences of his day, rather than of any exclusive preoccupation with medicine in itself. He used the data of medicine chiefly as an adjunct to his studies of biology, and of human psychology in particular, which, as we shall shortly see, he set out to base firmly upon physiology rather than upon the abstractions of metaphysics and epistemology.

3. Psychology.

A considerable amount has been written on Herder's psychological theories. On the whole, the recent work of Lehwalder[54] is the best individual contribution in this field, since it is thorough and well-informed, although it deals only with the psychology essay of 1778, and with Herder's theory of „Empfinden" in particular. The same writer prefixes his work with a useful review of most earlier works written on this aspect of Herder's thought.[55] The main defect of Lehwalder's work from the point of view of

the historian of science is that he is as interested in certain metaphysical doctrines as in the growth of scientific psychology, and compares some of Herder's theories with those of Heidegger.[56] Richter[57] gives an excellent summary of Herder's psychological ideas at the beginning of his work, but the rest of it is largely concerned with educational theories. Probst[58] tends to relate Herder's psychology too closely to the wider issue of „Humanität", a conception which is of little importance till the time of the „Ideen". The work of Götz[59] is good on the whole, but too often relates Herder's theories to those of Wundt, whose ideas could appropriately serve as a test of Herder's modernity towards the end of the nineteenth century, but scarcely today. The American critics M. Schütze[60] and R.T. Clark[61] are particularly interested in the scientific value of Herder's psychology, but, as we have often had occasion to remark, they tend to portray Herder as much more modern, as much more of an empiricist or positivist than he actually was. Such, then, are the major appraisals of Herder's psychology.

The greatest difficulty which besets all critics of Herder's psychological ideas, even as they appear in the essay on psychology in 1778, is that they are usually interwoven with notions from other areas of learning, particularly aesthetics, the theory of language, pedagogics, ethics, metaphysics, epistemology, sociology (and so-called „Völkerpsychologie") and history. In any case, psychology was usually regarded in Herder's day as a branch of philosophy, and scarcely yet existed as an autonomous discipline, far less as a fully-fledged science. It is therefore difficult to treat the subject in itself without referring to several allied branches of learning.

Herder himself first became interested in psychology through his early studies of aesthetics, which led him to reject the prevailing abstractions of

Klotz, Riedel and others in favour of a new aesthetics of sense-experience. Thus, at an early date, he began to favour a more empirical, physiological and scientific kind of psychology, with special attention to the functions of the senses, instead of the abstract, Wolffian theories of the Enlightenment.[62] We have already evaluated some results of this approach when discussing his use of experimental data, his interest in pathological cases, and his theories of sound and musical euphony, optics, and the "blending" of vision and touch. Thus, as Götz notices,[63] he did himself believe that psychology should be an empirical and scientific study. He actually writes in the „Journal":[64]

> Die Psychologie, was ist sie anders, als eine reiche Physik der Seele?

With these considerations in mind, it should not after all be impossible to assess Herder's psychological theories in relation to science, especially if we pay particular attention to the physiological foundation upon which he sought to establish them. For after he had dealt, in the fourth „Kritisches Wäldchen" of 1769, with the scientific background to the individual senses of sight, hearing and touch (already discussed in our sections on optics and sound), he set out to elaborate a general physiological theory of psychology as a whole. This aspiration culminated in the 1778 essay on psychology, and in the chapters of the „Ideen" which he devoted to the human mind and its relation to the body.

a) Introduction: the relationship between mind and body.

J.M. Baldwin, in his history of psychology, aptly sums up the development of the subject, in relation to the wider issues of philosophy, as follows:[65]

> The philosophy of the Greeks marked out the separation of mind and body; that of modern times seeks to bring them together again.

Judged in this light, Herder's psychology is typical of the modern movement. Again and again, we have seen how he attempts to reconcile all traditional dualisms, and that of mind and body is no exception to this rule. We have already seen, in our chapter on scientific methods, how he resolved this particular dualism in so far as it appears in the psychological problem of subject and object, the "problem of perception". We saw how, as usual, he offers several conflicting solutions, the chief of which were the sensationalistic one, which implies that the subject, the mind, is developed through sense-experience, the subjectivistic one, which suggests that our experience of the objective world, through the medium of the body, is conditioned by the pre-determined subject, the perceiving mind itself, and the Leibnizian theory that subject and object, mind and body, are parallel or mutually pre-adapted. The other dualisms of matter and force, inanimate matter and life, the raw materials of growth and the vitalistic "force" of the embryo, the physical world and the moral world, and the decaying body and the immortal soul, were each resolved in a similar equivocal fashion. However, they frequently reappear, in their old dualistic form, from behind the veil of „Kräfte" in which Herder habitually enshrouds them. For while he tries to overcome them by describing both dualistic poles as „Kräfte", their originally independent identities inevitably reassert themselves whenever he applies his inadequate "monism" to questions which had usually been answered dualistically in traditional philosophy and religion. Striving to avoid the truly monistic extremes of pure materialism and pure mysticism or spiritualism, yet using elements of both, he often fails to satisfy the requirements both of logic and of empirical science.

Thus, before we come to study Herder's more scientific, physiological theories of psychology, we must remember that the relatively scientific

elements represent only one aspect of his wider philosophy of mind and body. In themselves, especially in 1769, these ideas seem to imply that the mind is conditioned and determined by sense-experience, by physical, or rather by physiological functions of the body. In this way, he speaks of man's „materielle Seele" in 1769.[66] Yet in the wider, metaphysical problem of the soul and the body, his ideas are matched at the opposite extreme by the theory that the body is merely the product (as we also noticed in our section on embryology), the mirror, the expression of the soul. Thus he refers, in 1767, to „ein Platonisches Mährchen, --- wie der schöne Körper ein Geschöpf, ein Bote, ein Spiegel, ein Werkzeug einer schönen Seele sey",[67] and in an early version of his essay on psychology in 1774, himself uses this idea, describing the body as an „Analogon, Spiegel, ausgedrucktes Bild der Seele".[68] He explicitly refers to the Platonic origin of the conception, as we have seen, but Probst names Winckelmann, Schiller, Tetens and Shaftesbury as other exponents of it,[69] while Strothmann refers to medieval precedents,[70] and Rouché, who always tends to overemphasise this more spiritualistic side of Herder's thought, names Aristotle, Thomism, the Leibnizians, Plato, Lavater, Sulzer, Winckelmann, Hamann, Shaftesbury, Oetinger and others as writers who advocated similar notions.[71] We have ourselves already remarked on the rôle of this idea in Herder's embryological theories, noting the influence of Harvey, Needham and others upon it. But all this is really a metaphysical question, as is the theory of preadaptation or pre-stabilised harmony, and they need not occupy us any longer here, since we have already dealt with their psychological applications in relation to the problem of perception. We need only add that the pseudo-science of physiognomy, which Herder eventually abjured, rested upon the old Platonic

conception of the soul; but Herder had mentioned it in the 1760's, as we have seen, even before he knew the ideas of Lavater, Oetinger and most of the other thinkers named by various critics as precedents. He seems therefore to have found it for himself in the writings of Plato, perhaps with some stimulus from Hamann and Winckelmann.

However, most theorists in Herder's day believed that mind (or soul) and body are in some way parallel, and many, such as Hartley,[72] freely admitted that the true nature of their connection may remain unknown. Then Kant, by proving in his „Träume eines Geistersehers" that the nature of the soul or spirit and its relation to the body are not only unknown, but also unknowable,[73] removed the main metaphysical obstacle which stood in the way of a genuinely empirical investigation of the mind or consciousness (not the intangible soul or spirit), whose functions can be observed through the workings of the body. Herder was one of those who undertook this task, but, as we shall repeatedly discover, he never finally broke with metaphysical theories of soul and body, but attempted to combine them with his "physiological" psychology by means of such devices as his vitalistic and supposedly neurological „Kräfte". As Probst puts it:[74]

> In jedem organischen Wesen sieht er eine untrennbare Einheit von Physischem, Psychischem und Geistigem. Daher muß die Psychologie nach seiner Ansicht immer alle drei Komponenten zugleich ins Auge fassen ---

In other words, his philosophy of „Kräfte" does not make any clear distinctions between the physiological, the psychological, and the metaphysical aspects of consciousness; in fact, its main purpose is to make such distinctions unnecessary, although brain, mind and soul continue to reappear

in their traditional but unacknowledged rôles, uneasily coexisting in his thought.

All this corroborates our initial contention that psychology, in Herder's day, was still bound up with other extraneous subjects, particularly with metaphysics. Only when it ceased to occupy itself with qualitative conceptions such as soul or spirit could it become an empirical science of mind. A few thinkers were moving in this direction even in the eighteenth century, but the separation of psychology and metaphysics is not always observed even today. In this, as in so many other questions, Herder stood between two opposing positions. His psychology stands between the older metaphysical theories and the modern empirical theories of mind. But we must now pass on to evaluate the physical basis of his psychology, bearing in mind that it is only a part of his comprehensive philosophy of mind.

b) The brain and the physical basis of mind.

We have seen that, in 1769, Herder refers to the „materielle Seele" of man. This, like all materialistic premises in psychology, implies that the functions of the mind are associated with some area or areas of the body, and with physical processes within them. Accordingly, in elaborating his empirical psychology of the senses in the fourth „Kritisches Wäldchen" of 1769, he also declares:[75)]

> Nach diesen ersten Schritten --- wäre man nahe dran, um jeder Gefühlsart gleichsam ihre Gegend in der Seele einzumeßen ---

(The „gleichsam" is a characteristic reservation, for Herder is rarely willing to commit himself completely to any exclusive interpretation.) In the „Journal", he again refers to the physical basis of thought, grasping at Maupertuis' suggestion that dissections, or rather vivisections, of the

brains of criminals might supply new information:[76]

> --- die Bemerkungen, die Maupertuis vorschlägt mit dem Gehirn der Malefikanten würden dazu helfen, und denn würde gleichsam [note the „gleichsam" again] die Welt Materieller Ideen lebendig.

And in 1785, he suggests that music may influence our emotions directly by a physical process within the brain:[77]

> Ja, als man den grausamen Versuch machte, lebendigen Geschöpfen das Gehirn zu öfnen [sic], und durch gewiße Druckungen bei ihnen bald Schmerz, bald Freude erregte; mochten diese Empfindungen, auf eine grobe Weise bewirkt, etwas anders seyn, als was du [i.e. music] auf eine unendlich feinere Weise bewirktest?

However, this last utterance is scarcely typical, because, already in 1775, he rejects Descartes' theory that the soul is localised in the pineal gland,[78] and, in the „Plastik" of 1778, although he is prepared to conjecture roughly that the sensory „Kräfte" of the brain are situated nearer the external organs, particularly the eyes, while the „ewigere Kräfte" are situated nearer the centre of the brain, he now heavily qualifies the whole supposition that mental functions can be localised within the cerebrum:[79]

> --- so ist doch offenbar dies innere Gewebe von zu verflochtner feiner Art, als daß man mit Huarte ein Conklave von Cardinal= kräften zimmern, oder den innern Bau und Saft des Granatapfels nach seiner äußern Schale entwerfen könnte.

(We shall discuss Huarte's ideas later.) Here, it seems that he rejects not only the theory that each function or "faculty" can be localised within the brain, but also the whole pseudo-science of phrenology, which claimed to define mental resources and proclivities by the external conformation of the cranium, and which was yet to have its greatest vogue in the early nineteenth century. We shall examine this question later, however. Again in the

„Ideen", he rejects the method of localising faculties physically, this time with more vehemence:[80]

> Man wird aufhören, die Seele in der Zirbeldrüse, den Verstand im spezifischen Gewicht des Gehirns zu suchen, oder gar die feinsten Gedanken und Triebe in pergamentnen Rollen und Seilen auf= und abwinden zu wollen: leere Versuche, die nichts erreichen können, so wie sie bisher nichts erreicht haben.

The reason for this change of front, which occurred during the 1770's, is that he had come to prefer the vitalistic theories of Haller, as he interpreted them himself, to his own earlier, more materialistic and almost mechanistic ideas of 1769. He makes this clear himself in the „Ideen":[81]

> Nun zeigen alle bisherigen Erfahrungen, die der gelehrteste Physiolog aller Nationen, Haller, gesammlet, wie wenig sich das untheilbare Werk der Ideenbildung in einzelnen materiellen Theilen des Gehirns materiell und zerstreut aufsuchen lasse ---

For intangible "forces" cannot be localised or compartmented so readily as material "faculties", he believes. But he again refers to „das innere Gehirn" (presumably the cerebral medulla) in which „sich die Frucht der Gedanken unsichtbar und unzertheilt bildet".[82] (Hartley likewise believed that the medulla, not the cortical parts of the brain, is the seat of mental activity.[83]) Thus the brain is indeed the seat of thought, but it is not compartmented, and thought-processes consist in invisible "forces", not in visible material functions within it. The superiority of man's brain over that of other animals, as Götz notices, does not result from additional "faculties" or compartments peculiar to man, but in „die vollkommenere Ausarbeitung"[84] or „in der Proportion und in der Temperatur des Ganzen"[85] - i.e. in the more complex arrangement of constant basic elements, as we

earlier noticed. This latter theory represents Herder's growing preference, at the time of the „Ideen", for formal distinctions, but it unfortunately did not succeed in fully supplanting the earlier notion of „Kraft".

Let us pause for a moment to consider Herder's sources. It was from the Spaniard Juan Huarte (c. 1520-1592), whose work was translated by Lessing in 1752 under the title „Prüfung der Köpfe zu den Wissenschaften", that Herder derived his early belief that mental functions have a distinct physical basis, presumably in various areas of the brain. He read this work in 1767, as appears from his letters of that year,[86] and extracts from it occur in his early notebooks.[87] The following quotation from Huarte's work, in English translation, may serve to illustrate the man's ideas:[88]

> --- the fourth ventricle [i.e. of the brain] [has] both the office of digesting and altering the vitall spirits, and [serves] to convert them into animall --- The three ventricles placed in the forefront, I doubt not, but that Nature made them to none other end than to discourse and philosophise.

No doubt Herder found some of Huarte's localisations more acceptable than Descartes', since the "vitall spirits" were nearer his own habitual vitalism than were the mechanistic theories of the brain current among the French materialists. However, he did not adopt Huarte's archaic doctrine of mental "temperaments" - moist, cold, dry, etc.[89] - and, as we have seen, he soon came to reject all such ideas in favour of his own version of Haller's neurological vitalism. It is interesting that Kant, in his „Träume eines Geistersehers", a work which Herder reviewed, adopts (in 1766) a neurological theory, but with materialistic rather than vitalistic undertones, saying „daß alle Vorstellungen der Einbildungskraft zugleich mit gewissen Bewegungen in dem Nervengewebe oder Nervengeiste des Gehirns begleitet sind, welche man

ideas materiales nennt ---".[90] Finally, we may note that Herder was not the first to reject completely the attempt to localise mental functions exactly within the brain, as he did in the „Ideen". Argentier had already done so in the early sixteenth century, repudiating the theories of Galen, the first great theorist to suggest that all mental "faculties" have exact physical situations within the cerebrum.[91]

However, Herder had misunderstood Haller when he assumed that the theories of the great physiologist ruled out all localisations of the thought-processes. As Clark points out,[92] Haller had in fact correctly realised that the cerebral cortex plays a significant part in emotion (more correctly, perception) and cognition. Clark says that Herder failed to study or appreciate this part of Haller's work "for some inexplicable reason".[93] The reason is not inexplicable, and there is no need to suppose that he omitted to read the section in question. He saw in Haller's three „Kräfte" which he adopted under the titles of „Elasticität", „Reizbarkeit" and „Empfindung",[94] not the exact physiological functions of muscles, nerves, etc. (i.e. perfectly local phenomena) with which Haller associated them, but simply another addition to his already considerable repertoire of ill-defined and mysterious „Kräfte". He saw them as invisible, intangible and ubiquitous, as we have seen on many occasions, and did not relate them to precise functions as Haller had done. Thus he wrongly believed that Haller's explanation of nervous sensations and reactions in terms of "vires" or „Kräfte" excluded all possibility of localising functions of the mind, and he rejected all attempts to do so as "mechanistic".[95] It is true that he speaks of the "inner" part of the brain (presumably the medulla) as the seat of thoughts on one occasion in the „Ideen", as we have seen.[96] But

it is clear that he regarded this only as the central focus of the invisible and undivided nervous „Kräfte". He brings out this point later in the same work:[97]

> --- bei einigen Thieren kommen nicht einmal die Nerven beider Augen und bei keinem Geschöpf die Nerven aller Sinne so zusammen, daß Ein sichtbarer Punkt sie vereine ---

On this second occasion, he is arguing that mental processes are „geistig", not physical.

Götz says that he failed to appreciate the rôle of the cortex because it was unknown in his day.[98] As we have seen, this is not strictly true, because Haller had in some measure realised the significance of this organ, although he also attributed great importance to the medulla as a vital part of the brain.[99] Besides, Thomas Willis (1621-1675), to whose views on the brain Herder refers in some detail in the „Ideen",[100] had localised ideas and memory in the cortex of the great brain,[101] and Gall, whom Herder mentions in 1802,[102] also saw the cortex as the organ of intelligence.[103] Malpighi had held similar views, influencing the remarkably modern, but long unpublished theory of Swedenborg concerning the cardinal importance of the cortex.[104]

From all this, it seems probable that Herder did not omit considerations of the cortex, now known to be the main organ of thought and perception in the human brain, because he was entirely ignorant of it or because its function was completely unknown in his day. For although it was only in the later nineteenth and early twentieth centuries that Pavlov and his predecessors and followers began to map out accurately the "mosaic of functions"[105] in the cerebral cortex, several writers of Herder's age, some of whom were known to him, had drawn attention to it, and suspected that it

performed an important function in the processes of sensation and thought. Herder made no reference to this organ because he came to distrust all more specific localisations of mental processes, and he misinterpreted Haller's vitalism, linking it to his own metaphysics of „Kräfte" rather than to exact physiological functions, as Haller had intended.

Herder does put forward some suggestions concerning the physical basis of memory, however. In the fourth „Kritisches Wäldchen" of 1769, he writes:[106)]

> --- die ersten Eindrücke in das zarte Wachs unsrer Kindheits= seele gibt [sic] uns Farbe und Gestalt des Urtheils.

But in the „Journal", he says that we do not know how ideas are impressed upon and retained by the brain, and maintains that the (physical) theories of Huarte and Julius Caesar Scaliger are not satisfactory.[107)] And in the „Ideen", he says more explicitly that memory is „nicht körperlich sondern geistig".[108)] Yet later in the same work, he contradicts this statement, using the traditional physical theory of memory:[109)]

> Das Hirn der Kinder ist weich und hangt [sic] noch an der Hirnschale: langsam bildet es seine Streifen aus und wird mit den Jahren erst vester; bis es allmälich sich härtet und keine neuen Eindrücke mehr annimmt.

In fact, this is precisely the theory of Huarte, which Herder had pronounced inadequate in his „Journal", for Huarte writes:[110)]

> --- old men partake of much understanding, because they have great drinesse, and faile of memory, for that they have little moysture, and by this meanes the substance of the braine hardneth, and so cannot receive the impression of the figures ---

Thus Richter's[111)] contention that Herder does not adopt any position in the

question of the physical basis of memory is scarcely true; in fact, he suggests two conflicting solutions, those of the "wax" model of the brain, which also reminds us of Locke's ideas, and the alternative spiritualistic theory, which denied that memory has any tangible physical basis at all. As usual, he is attracted to two opposing theories, and, in this case, he does not even attempt to reconcile them.

He considered yet another physical factor in describing mental functions, however - that of the weight or size of the brain. In the „Ideen", he begins by denying that the specific weight of the brain can be a measure of „Verstand",[112] and later rightly adds that the relative weights of the brain and the rest of the nervous system are not a sufficient test of mental capacity either, since this criterion fails to take into account the fineness or distribution of the nerves.[113] (It was Sömmering and Blumenbach who suggested that the ratio of the size of the brain to that of the nervous system is a better criterion of mental ability than size of brain alone.[114]) However, he admits that larger brain capacity is a necessary condition for higher intelligence, such as that of man as opposed to the lower intelligence of the animals,[115] and now seems to regard Wrisberg's criterion of specific weight with more approval than before.[116] But all of these criteria, in Herder's mind, are of secondary importance to the degree of nervous complexity in the organism. This is indeed an excellent standard by which we can judge how advanced an organism is, but, as we have seen, he wrongly believed that this makes it unnecessary or even impossible to localise mental functions.

We shall conclude with a few words on phrenology. We earlier quoted a passage from the „Plastik" of 1778 in which Herder says, with reference to

the brain, that it is impossible „den innern Bau und Saft des Granatapfels nach seiner Schale [zu] entwerfen."[117] Similarly, in the „Ideen", he uses Camper's craniological measurements not as an indication of mental "faculties" or inner dispositions, but as an aesthetic and craniological test for distinguishing between animal and racial types. On the other hand, some laudatory remarks in his review of Lavater's „Physiognomische Fragmente" in 1776[118] suggest that he had sympathised with phrenology at that time, and we know from Caroline's memoirs that he displayed interest in Gall's phrenological system in his last years.[119] All this, however, is insufficient evidence for drawing any detailed conclusions about his attitude to phrenology. We can only say that he made no extravagant use of it himself, and that he cannot be blamed in any way for the later vagaries of Romantic theorists in this now obsolete pseudo-science.

This whole section has shown us that Herder early expressed a genuine interest in the physical basis of mind, but that the vitalism of Haller, which Herder generalised and assimilated into his own metaphysics of „Kräfte" (as we shall see in more detail later), drew him away from this important and progressive empirical study, thus diminishing the value of his contribution to physiological psychology.

c) The nerves and the neurological basis of mind.

We have seen how Herder's interest in psychology arose out of his early studies in aesthetics, and how he set out to establish both of these disciplines upon the empirical data of physiology. We also noticed how, in the 1770's, he began increasingly to distrust the more materialistic theories

of thinkers such as Huarte, who was confident that mental functions can be localised with precision in certain areas of the brain. Among the reasons for this change in his attitude were his dislike of the psychological theories of the Enlightenment, which treated the mind as composed of rigidly separate, abstract "faculties", and which he found equally distasteful when interpreted in concrete terms, as in the materialistic theory of a "compartmented" brain. (We shall return to the problem of "faculties" later.) Secondly, he disliked the dualism inherent in the earlier psychological theories, even in Descartes' "mechanistic" conceptions, and, as a follower of Leibniz, he preferred gradual transitions, not only between the various mental "faculties" in the abstract sense, but also between the mind as a whole and the body. And thirdly, even in the 1774 and 1775 versions of his essay on psychology, he is much influenced by the metaphysical, non-physiological vitalism of Leibniz, even before he made wider use of the physiological vitalism of Haller. All this soon led him, in psychology as in so many other areas of his thought, to prefer vitalistic interpretations of both mind and body in terms of „Kräfte".

Vitalism, in psychology, has very often been associated with neurology. The nerves, above all, can be envisaged as the seat of an intangible yet extremely active principle, which produces the astonishingly swift and complex reactions we associate with the processes of thought and the movements of the body. It is no wonder, then, that Herder soon came to prefer the neurological theories of Haller to the materialistic ones of Huarte and others. Indeed, as early as in 1766, he had already declared himself „[daß] die ganze Empfindung auf die Beschaffenheit der Nerven des Gefühls ankommt".[120)]

But just as he had introduced many different unknowns, in biology, as descriptions of the elusive life-principle, so also did he employ various distinct theories in psychology to describe the workings of the nerves upon which the mental functions depend. Thus before we discuss Haller's theory of three physiological "vires", the theory of which Herder made most use, we shall first examine some of the other, more specific neurological hypotheses which he borrowed from the science of his age.

(i) The theory of a "nervous fluid".

In the „Ideen", Herder refers on several occasions to the old theory that the nerves contain a subtle "nervous fluid" („Nervensaft") which is the agent of both sensation and motor-impulses. He first refers to „die mehrere Mischung, Läuterung und Ausarbeitung der Lebenssäfte" in animals as opposed to plants, and mentions in particular „den feinern Strom, der die edlen Theile befeuchtet".[121] This fluid, which may possibly be only the blood in this case, is apparently regarded as a lubricant for the more delicate animal organs. Soon after, he says that more advanced creatures have more refined juices,[122] and later, referring to man's superior upright posture, he declares that this allows only „die feinsten und reichsten Säfte" to ascend to the brain.[123] (This recalls the archaic botanical theory, which Goethe, for example, uses in his „Metamorphose der Pflanzen", that progressively more rarified juices are found from the root to the flower of the plant.) However, he later says, in his arguments for immortality, that this nervous fluid is not itself a vehicle of sensation, but that it only contributes (presumably as a lubricant) towards the physical health of the brain and the nerves, whereas the soul itself is „geistig".[124] He concludes:[125]

> Also ists eine schwache unphysiologische Vorstellung, sich das Gehirn als einen Selbstdenker, den Nervensaft als einen Selbst= empfinder zu denken.

From this, it is clear that the "fluid" theory of the nerves, in itself, was too "mechanistic" for Herder; he condemns it for this reason in his mature period, along with other attempts to localise nervous and mental functions in specific physical components of the body, and retains it only in modified form, saying that it acts as a lubricant.

The theory that juices or fluids are responsible for nervous functions goes back to Galen at least.[126] Descartes believed that the nerves are tubular, and filled with a fluid which produces muscular movements.[127] Hoffmann of Halle and Malpighi had similar ideas, and believed that the "nervous fluid" comes to the nerves from the cerebral cortex.[128] The great physician Boerhaave was of the same opinion,[129] and it was probably from him that Haller took his own theory that a "liquor nervosus"[130] is secreted from vessels in the cortex into small tubes within the nervous medulla, producing both sensation and movement in the body by its volatile motion:[131]

> Quare in universum certum esse videtur, ex vasis corticis separari in cavas medullae fistulas liquidum aliquod, quod in nervosos tubulos continuatum, ad extremos nervorum fines propulsum, sensus motusque causa est.

But although Swammerdam, in an unpublished work, had long since proved that the nerves are not hollow, liquid-filled tubes, this belief persisted till the early nineteenth century, and Sömmering referred to the fluid as "animirt",[132] while Lamarck considered it to be the seat of the life-principle.[133] No doubt the belief first arose because certain parts of the brain, notably the ventricles, do contain some fluid. Herder knew this,

but maintained that such fluids only serve to keep the brain healthy.

Herder's repudiation of this theory, like his disregard for the cortex, both of which figured in the works of Haller, his acknowledged mentor in physiology, shows once again that he misinterpreted Haller's vitalism, and wrongly believed that it made it impossible to localise mental functions, or to reduce them to material agencies. He probably realised that the "nervous fluid" hypothesis lent itself too readily to undiluted materialism; in fact, his friend Knebel used it in an argument for materialism,[134] and Lamettrie declared that this fluid mechanically transmits sensations from the sensory organs to the brain.[135]

All this tends further to corroborate our earlier assertion that Herder was less interested in the exact data of physiology in themselves than in adapting them, or rather distorting them, to suit his own wider philosophy of „Kräfte", thereby hoping to bridge the traditional dualism of mind and body.

(ii) The rôles of electricity, animal magnetism and galvanism in neurological theory.

Since electricity, animal magnetism and galvanism afforded essentially vitalistic interpretations of nervous processes in Herder's day, postulating as they did mysterious physiological or even psychic "forces", we should naturally expect that they might find more favour with him than did the essentially mechanistic theory of a "nervous fluid".

Accordingly, we noticed in our section on vitalism that Herder, like Linnæus, suggested that electricity might be akin to the elusive life-principle itself. Such ideas cannot be compared with the modern discovery that nervous reactions involve electricity, however. They are rather an offshoot of the belief in "animal magnetism", which, originating in the

medical occultism of Paracelsus, van Helmont, Croll, Stahl and Hoffmann,[136] gained new ground in Herder's day with the spread of biological vitalism and the advent of Romantic „Naturphilosophie".[137] Bertrand, in his history of animal magnetism, has clearly demonstrated that the fashionable doctrines put forward by Mesmer and others around the end of the eighteenth century were really only a revival of the older mystical medicine of the early seventeenth century.[138] But even before Mesmer publicised his own version of these older doctrines in the 1780's, Herder wrote (around 1769):[139]

> Der Magnet müste [sic] so sehr verstärkt werden, daß seine Kraft fühlbar würde. Ich halte es für möglich.

And in the early or mid-1780's, in his „Glaucon und Nicias", he imagines „einen neuen Sinn für die elektrische und magnetische Materie, für die Kraft der Schwere, der Anziehung oder gar für die Wirkung der Gedanken".[140] But in 1785, he is more sceptical, perhaps thinking of the already notorious Mesmer, who was practising in Paris around this time.[141] He writes to G. Müller:[142]

> Bald werden wir's auch hören, daß Christus --- vermöge des höchsten ihm einwohnenden Magnetismus seine Wunder gethan, sogar in die Ferne gewirkt u.s.w.

(In fact, the illustrious theologian Butler, whom Herder mentions in 1781,[143] had earlier drawn just such an analogy between magnetic effects and the miracles of Christ.[144])

Thus, Herder appears to have heard of and shown interest in animal magnetism before Mesmer inaugurated the vogue for it in the 1780's. He must have encountered a reference to it in Kant's „Träume eines Geistersehers" of 1766; Kant expressed doubts in this work about the claim „daß magnetische Stäbe auf Fleisch und Knochen wirken".[145] The editor of Brugmans' work

„Beobachtungen über die Verwandtschaft des Magnets" also referred to animal magnetism (in 1781),[146] but, since Herder had shown interest in the subject long before he read this work, we must conclude that he first heard of it either in Kant's work, or perhaps in the works of Hoffmann of Halle, or in some representative writings of the Paracelsian school of medicine, which he may have encountered in the course of his wide reading.

Galvani's experiments with the effects of electricity on animal organs[147] revived Herder's interest in such phenomena in the 1790's. He first mentions Galvani's experiments in a letter to Knebel in 1793,[148] and twice refers to galvanism in his published works.[149] We know that one physician recommended him to try galvanistic treatment for his eyes in 1803, the year of his death,[150] and Caroline informs us that he cherished great hopes that the study of galvanism would provide new information on electricity, especially in relation to the „Organisation des Menschen".[151] He was also keenly interested in the galvanistic experiments which his friend J. Ritter, a Romantic and a student of physics, performed in his presence.[152] On the other hand, we know that his caution did not desert him in this matter either, since he wrote to his son August in 1800, vehemently denouncing all traces of „Galvanismus, Humboldtianismus, Ritterianismus, Baderianismus" in his son's thesis, so long as they were not reinforced by exact empirical observations.[153]

It is clear therefore that Herder was interested in electricity, animal magnetism and galvanism as possible agents in physiological processes, and that he mentions them at various times in his writings. But they are really subordinate to his more general theories of nervous functions and „Kräfte". They appealed to his interest in occult „Kräfte", but they did not finally overcome his more sceptical feelings. As we shall see, the more comprehensive vitalism he borrowed from Haller was by far the greatest single

influence upon his "neurological" psychology.

(iii) The theory of expansion and contraction of the nerves.

We noticed in our sections on the problem of perception and on dialectics that Herder often describes our reactions to the external world in terms of expansion and contraction, and we compared such ideas with Goethe's „Systole und Diastole", etc. This theory, as Herder uses it, originally comes from neurology, and he probably first encountered it in Burke's work on the Sublime and the Beautiful. He himself observes of Burke in 1769 „[daß] er überall das Erhabene auf ein Gefühl der Anstrengung, das Schöne auf eine sanfte Erschlaffung der Nerven zurückleitet".[154] But on this occasion, he also adds, „ich laße ihm [i.e. Burke] alles, was System ist", and says that he values Burke mainly for his concrete observations; besides, we have seen that he thought that the theory of Montesquieu, who also believed that nervous reactions consist in expension and contraction of the nerves and fibres, was too crude to explain how the environment acts upon the organism.[155] In fact, this theory, especially in its literal form, must have seemed too mechanistic to him. Yet on the other hand, he applies Burke's theory to psychology in his 1778 essay, distinguishing the expansive „Mitgefühl und Mittheilen" we experience in the face of beauty and the „Zurücktritt auf sich, mit Selbstgefühl" which is our reaction to sublimity, calling all this „eine Theorie, über die ich ihn [i.e. Burke] --- fast beneide".[156] He even declares outright that the nerves, like the „Faser" or „Fiber" of the body, expand and contract in their reactions to external stimuli, likening these responses to „eine Ebbe und Fluth",[157] and he again says of the nerve:[158]

> --- er ziehet sich zusammen oder tritt hervor nach Art des Gegenstandes, der zu ihm gelanget.

And in the „Ideen", he refers to Gaubius' theory of the expansion and contraction of the nerves, without rejecting it.[159] Besides, we have seen that he used the image of expansion and contraction to describe many psychological phenomena in his mature period, and Lehwalder draws attention to other passages in his psychology essay of 1778 where he says that, with an object of attraction, the nerve „entgegen wallet", and that „bei Unlust, Schmerz, fleucht der Nerve und grauset".[160] Lehwalder contends that such passages are inspired by the archaic psychology of corporeal daemons and spirits, but it is more likely that they are merely rather extravagant formulations of the theory that the nerves expand and contract in the face of pleasant and disagreeable sensations respectively.

It is therefore probable that Herder at times found the theory useful, but that at other times, as with the theory of a "nervous fluid", he found it impossible to accept it literally, knowing that it could be construed in mechanistic terms, as in Montesquieu's work.

As Dessoir observes, Haller had disproved the theory that the nerves themselves expand and contract.[161] He had retained the conception only in the case of certain kinds of tissue and muscle, which he observed to contract under stimulus, but denied that the nerve itself reacts in this way.[162] Yet as we have seen, this no more prevented Herder from applying the theory to the nerves in his own way, or as a universal psychic principle, than did Haller's observations on the cerebral cortex and the "nervous fluid" deter him from ignoring or repudiating these data in favour of his own vaguer vitalism. Once again, we see that he was less influenced by exact physiological observations than by his own metaphysical preferences.

(iv) The vibratory theory of the nerves.

Already in 1767, Herder writes „[daß] man das Nervengebäude sehr treffend

mit einem Saitenspiel vergleichen kann",[163] and, in 1769, he speaks of „Nervenschwingung".[164] Again in his psychology essay of 1778, he speaks of the human nervous system as a „Saitenspiel der Gottheit",[165] and in the „Ideen", he describes man's nervous system, referring to „alle Theile seines vibrierenden Wesens",[166] while he writes as follows of the eye in the „Adrastea":[167]

> Das Licht reizt, Theile des Nervs schwingen sich; die Empfindung erfolgt.

It therefore appears that, alongside the theories of electrical or magnetic principles behind physiological reactions and of nervous expansion and contraction, Herder also employed the vibratory theory of the nerves. On this occasion too, he was undeterred by the observations of Haller, who proved that the nerves are <u>not</u> subject to vibration or oscillation. Haller wrote:[168]

> Neque oscillationes in nervo produci possunt ---

But let us briefly glance at the ancestry of the vibratory theory. Among the first to believe that the nerves, or particles within the nerves, react to external stimuli by vibrating were Hobbes[169] and Newton.[170] Hartley[171] and Priestley,[172] both of whose works Herder read, first systematised the idea and gave it wider currency, and it was adopted by such physiologists as Metzger and Schmid,[173] and the psychologist Lossius, in the second half of the eighteenth century.[174] It is clear from his review of a work on poetry and music by Daniel Webb that Herder also encountered it in the work concerned in 1772; he lists the types of vibrations caused by music, according to Webb, as follows:[175]

> Nun bringt er alles in vier Klassen: die Nerven werden plötzlich <u>angegriffen</u>, oder sanft und ruhig <u>fortgezogen</u>, oder <u>erhöht</u> und ausgebreitet oder <u>niedergeschlagen</u>.

But since he had used the vibratory theory in the 1760's, before reading the works of Hartley, Priestley and Webb, we can only conclude that he had heard of this old Newtonian conception in some other work, probably in one of the works on musical acoustics which he read in those years. For writers on acoustics often (with some justice) compared the ear's response to musical sounds with the behaviour of the vibrating stringed instrument. But in the case of the ear, as with other organs, it is not the nerves, but other parts, such as the auditory hairs, which vibrate.

All this shows that Herder favoured the vibratory theory of the nerves throughout his life, even although it was originally a "mechanistic" conception (as used by Hobbes, Hartley and others); it probably appealed to his intensely musical nature. He used it in conjunction with the theories of electricity, nervous expansion and contraction, etc., in a characteristically eclectic fashion, with little or no regard for the exact observations of Haller.

(v) Haller's neurological theories and their influence on Herder.

We have seen that Herder was already interested in nervous physiology in the 1760's. In fact, as Reimarus wrote, it had become very fashionable in the second half of the eighteenth century to provide a "physiological" basis for psychological theories in general (especially in the British empirical school and the French materialist school, and those who were influenced by them). Reimarus writes:[176)]

> Denn seit Priestley in seiner Vibrationstheorie der Welt eine Erklärung der kompliziertesten psychologischen Prozesse gegeben hatte, galt es --- für modern, psychologischen Abhandlungen ein physiologisches Mäntelchen umzuhängen.

In this respect, Herder was following an established tendency of his age, which saw the appearance of numerous "physiological" psychologies, whence he himself drew many ideas for his own varied system.

In 1772, he was again studying physiology, thus resuming his earlier studies in Riga, for he writes to Hamann in August of that year, referring in some detail to Unzer's then recently published study of physiology, and to the heart-muscle in particular.[177] It also appears from his later writings that, at various times, he studied Mead,[178] Glisson,[179] Metzger,[180] Platner,[181] Prochaska[182] and Michaelitz[183] on the nerves especially, as well as the other writers we have named.

But the greatest influence upon his ideas on this subject were the two great physiological works of Haller, which he mentions again and again. Clark declares that he probably read Haller's works in 1774,[184] and claims that this influence, along with that of Hartley and Spinoza, was in great measure responsible for leading him out of his Bückeburg religious phase into his mature period.[185] Clark also says that the main difference between the 1770 and 1778 versions of the „Plastik" arises because he read Haller's works in the interval between the two versions, and he also explains the difference between the 1774/1775 and 1778 versions of the essay on psychology by the same circumstance.[186] He adds that Herder first mentions Haller as a physiologist in the „Älteste Urkunde" of 1774.[187]

Herder, however, gives an explicit reference to Haller's work on physiology in the 1769 notes for his „Plastik", as published by Suphan:[188]

(s. Hallers Physiol. von der tela cellulosa)

He calls Haller „ein großer Physiolog" in a letter to Lavater in 1772,[189] and, already in 1771, he writes to Merck as follows:[190]

> Ich habe --- seine [i.e. Haller's] neuen Theile von Physiologie (Sinne, Seelenkräfte, und Oekonomie des Lebens) durchstudirt ---

All this shows that Clark is quite wrong in the dates he gives for Herder's study of Haller, and that, since he studied his works between 1769 and 1772, before and at the very beginning of his Bückeburg period, they cannot be so readily seen as a powerful new incentive leading him out of his religious phase and into his mature period, as Clark claims. We may add that Martin Schütze, who says that Herder studied Haller's work between 1772 and 1774,[191] also places this study too late in his career. It is obvious, therefore, that Herder did not come upon Haller's work as a sudden revelation, in the way that these and some other critics suppose. Haller was only one of many physiologists whom he studied from his Riga years onwards, and he happened to find the vitalistic triad of „Elasticität", „Reizbarkeit" and „Empfindung", as he calles Haller's three "vires", a more convenient basis for his own general, metaphysical vitalism of gradually ascending degrees of conscious „Kräfte" than the other theories he had hitherto encountered. However, as we have seen, he continued to use other theories whenever it suited him, even where Haller's observations contradicted or disproved them.

After studying Haller in 1771, he writes to Merck:[192]

> Ich habe --- meine Hochachtung gegen diesen großen Mann, trotz aller Mühe, nie zum Enthusiasmus aufschwingen können.

This confirms our earlier contention that Herder paid little attention to Haller's own observations and conclusions, but simply used them eclectically, along with conflicting theories, as part of his own general vitalistic philosophy of mind and body. For Haller, as we have seen, showed that we cannot describe the functions of the nerves in terms of vibrations, as

Herder did; he also declared that they are not subject to expansion and contraction, or of an "elastic" nature,[193] whereas Herder on several occasions continued to say that they are. Besides, Haller denied that nervous activity is electrical, since he believed that electricity would not remain in the nerves, but disperse itself throughout the body,[194] whereas Herder declared that the vital principle is of an electrical nature, as we earlier noticed. And Haller had explained the action of the nerves by the "nervous fluid" hypothesis, which Herder rejected as such in the „Ideen", likewise ignoring Haller's remarks upon the cortex. Götz rightly notes that he also failed to understand what we should call irritability (Herder's „Reiz" or „Reizbarkeit", the ability to react to stimulus):[195]

> Das Phänomen des Reizes erscheint ihm als etwas Dunkles, Geheimnisvolles, das er stellenweise mit dem Triebe zusammen= fließen läßt. Er hat augenscheinlich das Wesen des Reizes nicht erfaßt.

Unlike Haller, he fails, especially in his psychology essay of 1778, to distinguish clearly between irritability, which is common to all living matter, and what we should call contractibility, encountered in fibres, muscles, etc., and he seems to apply his „Reiz" or „Reizbarkeit" indiscriminately to the lowest manifestations of life and to the „Fiber" or „Faser" of muscles, etc. Furthermore, he believes that „Elasticität", „Reizbarkeit" (or „Reiz") and „Empfindung", as he treats them in the „Ideen" and in the essay of 1778[196] are three grades of physiological (or even psychic) activity, which differ only in <u>degree</u>, and which contribute to one another in an ascending progression from the lowest reactions of (living) matter to the highest mental activity:[197]

> Das Resultat der Reize wird Trieb; das Resultat der Empfindungen, Gedanke.

Yet as Lehwalder observes:[198]

> Reiz und Empfindung werden von Haller nicht zusammengesehen, d.h. genetisch verstanden wie bei Herder. Der Reizvorgang hat seinen Ort im körperlichen Organ [i.e. when seen as muscular contractibility] und ist unabhängig von Empfindungsvorgang --- Aber gerade diese Trennung von Reiz und Empfindung leugnet Herder.

Lehwalder rightly concludes of Herder:[199]

> Hallers Lehre vom Reiz muß gleichsam neu gedacht, d.h. das Schema vom Muskelreiz mit einem neuen, eben psychologischen Inhalt erfüllt, Hallers Physiologie muß erst „mit Geist erfüllt" werden ---

He also admirably summarises the main features of Herder's obscure psychological version of Haller's physiological vitalism as it appears in the 1778 essay:[200]

> Wenn das „Nervengebäude" die Einheit von innen und außen --- stiftet, wenn der Nerv Reiz, Empfinden, Denken und Wollen verbindet, wenn er Reizdaten und Sinnesbeiträge aufnehmen und in Empfindungen verwandeln kann, wenn dieser „innere Äther" dem „Kopfe Licht, dem Herzen Reiz" wird, müssen Nerv und Empfinden von einer „Natur" oder zumindest eng verwandt sein.

„Reiz" is for Herder neither a physical nor a physiological phenomenon in the strictest sense, as Lehwalder observes; it is simply a „Strukturmoment des Empfindens", an ingredient of his basically metaphysical, Leibnizian psychology, lending it outwardly a physiological and scientific colouring or „Mäntelchen", as Reimarus would have called it.[201] Thus Herder simply added a misinterpreted version of Haller's physiology, in the 1778 version of his essay on psychology, to his own vitalistic, anti-faculty theory of psychology, which we shall discuss later. For we may recall that, even in his 1769 sketch on planetary souls, he had already used the terms „Kraft"

and „Monas", following Leibniz's philosophical vitalism, to describe the "souls" of both man and the planets. Haller's "vires" were simply added to this a few years later.

Haller had quite simply distinguished, according to his precise observations, between the following physiological processes - between the irritability of all living tissues (including the „Fiber" or „Faser" to which Herder so often refers), the contractibility of muscles, which draw themselves together under external stimuli, and the sensibility of the nerves, which, as we have seen, he explained by the old theory of a "nervous fluid". (We have used Clark's concise summary of Haller's categories here.[202]) Herder called these „Elasticität", „Reizbarkeit" and „Empfindung" in the „Ideen", as we have seen, and treated them, as he had done with „Reiz" and „Empfindung" in 1778, as gradually ascending degrees of psychic activity, as a means of bridging the dualistic gap between mind and body, and between emotion and reason, whereas Haller had simply related them to definite physiological functions of the body, in keeping with the earlier studies of Harvey,[203] Glisson[204] and others on irritability. But because Haller called them "vires" ("vis contractilis", "vis insita musculi", "vis nervosa"[205]), Herder could at once label them as mysterious „Kräfte", and use them as additions to his growing stock of obscure psycho-physical, vitalistic agencies, which already included vibratory „Kräfte", "forces" of expansion and contraction, "ether", magnetism, etc. In his psychology essay of 1778, he also adds to his collection the purely physical phenomenon of „Elasticität" - the ability of physical bodies to recover their size and shape - citing it in a list of <u>physical</u> „Kräfte",[206] while in the „Ideen", he applies the word to <u>physiology</u>, to the „Faser" of living bodies, apparently regarding it as equivalent to Haller's "vis contractilis" manifest in all tissues.[207] (In

the 1778 essay, he uses only „Reiz" and „Empfindung", so that „Reiz" seems to do duty for two of Haller's three "vires", for the "vis contractilis" and the "vis insita musculi".) He thus completely misunderstood Haller, and ignored almost everything of scientific value in his work. We need not trouble to cite all his references to Haller, which are most frequent in the 1770's, for on almost every occasion, he is only talking emotionally about undefined „Kräfte". He used them to overcome traditional dualism, in appearance at least, so that he could introduce both empirical and metaphysical arguments at will. But by and large his vitalistic psychology, with its „Abgrund innerer dunkeln Kräfte",[208] inclines much more to metaphysics, in the tradition of Leibniz, than to empiricism. It has been greatly overrated by critics, especially by the Americans Schütze and Clark; as Herder uses them, Haller's three "vires" are far closer to such metaphysical schemes as Aristotle's "vegetative, sentient and rational souls"[209] (which he must have encountered in Huarte's work,[210] if not in Aristotle's own writings), than to truly physiological and scientific psychology.

(vi) Conclusion: Herder's psychological vitalism.

As Clark[211] and Lehwalder[212] observe, Herder took the step of reducing Haller's „Kräfte" to one common factor, calling them „sinnliche Darstellungen einer und derselben Energie der Seele".[213] As Clark admits, "Such a statement is, of course, purely metaphysical".[214] But this same writer adds of it:[215]

> If we were to think away Herder's one metaphysical assumption, we might be reading a treatise from the modern behaviourist school.

Yet as we have seen, not only this "one" unified, absolute „Kraft" of the

soul as a totality, but also the individual, supposedly "physiological" „Kräfte" which Herder borrowed from Haller, are vague, misunderstood, and metaphysical, so that we should have to "think" them all "away" before we could detect the slightest trace of behaviourism.

Another way of implying that Herder's psychology is fundamentally modern is to say that vitalism itself is modern and scientific. There is indeed a certain case for alleging this, for, since vitalism was banished from biology, it has still held out in certain psychological theories. As one modern historian of biology writes:[216)]

> Today it is the brain which is the last stronghold of vitalism: the workings of this organ are referred to an ill-defined entity known as "mind". Most neurophysiologists, however, are reasonably confident that human behaviour can and will prove wholly explicable in terms of the physicochemical interactions of brain cells.

But present-day psychological vitalism, when it does appear, is confined to the workings of the mind or brain, whereas the rest of the body is regarded as a complex system whose workings can be explained without reference to unknown vital principles. But, as we have seen, Herder's psychological vitalism was not of this kind. It extended throughout the biological world, and, in his psychological writings at least, the body, with all its muscular and nervous „Kräfte", is described just as vitalistically as the mind. Schütze, however, sums up Herder's psychology as follows:[217)]

> The vital principle, interpreted as the immaterial, sensible principle of spontaneity, functions in integral unity with the mechanism of nature --- Neither the immaterial principle of spontaneity, nor the physical principle of mechanism is absolute, but both interact, furthering and limiting each other.

But it was precisely in order to avoid such dualistic interpretations that

Herder adopted his scheme of pseudo-physiological „Kräfte". Both body and mind are governed by vitalistic principles. Schütze's words are inspired by modern dualistic vitalism, and, while they may indeed apply in many cases to Herder's involuntary procedure (for, as we know, he continually lapsed back into traditional dualism in spite of himself), they do not fairly reflect his attempts to formulate a vitalistic monism by means of all-pervading „Kräfte". For as we have observed, he debarred all "mechanistic" theories, in name at least, from his psychology, except in his more radical writings of 1769, and on a few isolated occasions afterwards. His „Kräfte" were intended to replace both mind and "mechanism", and to overcome such traditional dualism altogether. But of course, he only succeeded in part.

Yet another way of defending vitalism is to say that science and philosophy cannot prove that it is false. Schütze writes:[218)]

> There is no scientific or philosophical proof that spontaneity may or may not be an integral part of the mechanism of nature.

Kant already said as much in his „Träume eines Geistersehers", but he rightly went on to show that ("spontaneous") agencies such as soul or spirit have no place in a logical or empirical theory of the mind and body. All such categories as spontaneity and uniqueness have no place in scientific investigations,[219)] and belong entirely to metaphysics. Science cannot refute them, but it cannot admit them either. Introducing them into psychology is equivalent to saying that psychology cannot be scientific. Yet we noticed at the beginning of this section that Herder himself set out to study the subject with the express conviction that it could become a science, and he wrongly believed that his „Kraft" was an empirical and scientific conception. Schütze later declares that "Herder's philosophy is the most comprehensive form of Positivism",[220)] despite such undeniable

facts. All this is but another attempt to portray Herder as more modern and more scientific than he was, and it simply succeeds in perpetuating Herder's own questionable metaphysical arguments.

There is one further way of depicting Herder's vitalistic ideas as more modern and scientific than they were - that is to equate his „Kraft" or „Energie" to modern physical force or energy, as Clark does. We have already seen, in our chapter on the physical sciences, that this conclusion is inadmissible. But we may here add that certain modern psychologists have used the idea of "behavioural energy" as a model for the mind. In order to forestall any critic who may be tempted to use this in the future to claim that Herder's psychology anticipates yet another modern idea, we may here point out that, unlike Herder's theory of „Kraft", the modern theory does not presume to say that such "energy" actually exists as a psychic agency behind thoughts and actions, as a qualitative conception akin to that of the soul, but only uses "energy" or "force" as a convenient descriptive <u>model</u> for the mind. (It is not even the same as the quantitative physical idea of energy, although the workings of the body certainly can be described in terms of work, energy, etc. - but the latter procedure is only applied physics, not psychology.) We may here recall the parallel difference in biology between Herder's "explanatory" vitalism and Blumenbach's more scientific "descriptive" vitalism, and in physics, between Herder's qualitative „Kraft" and Boscovich's quantitative or "relational" conception. However, even the modern psychological theory shares many of the defects of Herder's „Kraft" or „Energie". One modern scientist criticises it as follows:[221)]

> Energy models, by lumping together diverse processes which affect the strength of behaviour, can lead to an over-simplification of the mechanisms underlying it, and distract attention from the complexities of the behaviour itself.

The same writer adds of these models:[222]

> They have been strangely sterile in leading to bridgeheads with physiology.

He then concludes of the whole theory:[223]

> --- it seems possible and preferable to formulate behaviour theories in which concepts of energy, and drives which energise behaviour, have no rôle.

All this applies perfectly to Herder's „Kraft" too. While giving the appearance of physiological explanation, it really over-simplifies behaviour and distracts our attention from its complexities, and is, in fact, quite remote from scientific physiology.

Herder's psychological vitalism thus shares the defects of his biological vitalism, which we examined earlier. But it also shares with it the limited advantage that it helped to counteract the crude mechanistic theories of the age, by emphasising that the mind, like the organism as a whole, is not simply the inert recipient of outside stimuli. We now know, in fact, that "the central nervous system is not normally inert, having to be prodded into activity by specific stimuli external to it. Rather it is in a state of constant activity - a state supported primarily by the non-specific effects of stimuli acting through the brainstem reticular system."[224] In this sense alone can scientific psychology admit something akin to "spontaneity".

Herder writes in his „Älteste Urkunde" in 1776, referring to Haller's physiology in support of his statement:[225]

> Da blitzt Licht! da strömt Glut! das Herz schlägt, Gedanke und Wille wandelt; tausend Düfte, Regsamkeiten und Kräfte, die uns durchwehen, treiben und - sonderbares Wunder! - sich in sich zur Einheit finden, fühlen: ich bin Kraft!

These words reveal another major factor in his psychological vitalism. He wished to infuse life and subjective content into the abstract world of Enlightenment psychology, and to appeal to the senses and emotions as well as to the reason. His „Kraft" provided an excellent expression for this urge, and, as such, it also symbolises the feelings of the „Kraftgenie" of the Storm and Stress period. But Herder himself treated it as a reality, not a symbol, and he superimposed upon it the purely physiological "vires" of Haller, so that only confusion resulted. His psychological vitalism is much more permeated by emotional enthusiasm than are either his biological or his physical theories, and it accordingly bears even less relation to empirical science than they do.

d) The functions of the mind.

(i) Herder's attack on "faculty psychology".

Clark on several occasions mentions Herder's attacks on "faculty psychology" as propounded by earlier thinkers. But under this heading there fall a number of distinct ideas, which Clark does not distinguish clearly from one another. For "faculties" can be seen firstly as the multifarious, ill-defined agencies with which physicians of later antiquity and of the Middle Ages peopled the body, and secondly, they can be seen as physical compartments of the brain, or thirdly, in a more modern sense, they can be used to designate logical divisions of the mind. As it is important that these senses should not be confused, we shall begin by discussing the biological "faculties" which Clark mentions as equivalent to the many "vires" of the medieval thinkers, and only then shall we be free to discuss Herder's theories on the functions of the mind itself.

A. The biological "faculties" or "vires".

Clark points out that Haller, with his "vires", rendered the great service of reducing to only three the hosts of "vires" by which medieval physicians believed the body to be tenanted.[226] He considers this achievement as a severe blow to "faculty psychology".[227] But although, as Clark points out, Aquinas had postulated 53 "vires", which he divided into "vires superiores" such as the will, and "vires inferiores", such as life and the senses, Haller was concerned only with the "vires inferiores", with purely physiological or biological categories, and he had nothing to say about "faculty psychology" as such. On the other hand, the eighteenth century Wolffian "faculty psychologists" were not interested in biology or physiology at all, so that Haller's achievement bears no direct relation to Herder's onslaught on Wolffian ideas. Besides, as we shall see, Herder's attacks on Wolffian "faculty psychology" date from a time long before he read the works of Haller.

It was Galen who introduced the doctrine of "faculties" into physiology, postulating no less than 60 different varieties of "faculty", "dynamis", "virtus" or "vis" (as they were variously called) as residing in the human body.[228] As Joseph Needham points out in his history of embryology, this was "nothing more than a concise statement of the phenomena [e.g. digestion, heartbeat, sleep, etc.] themselves".[229] Haller had described three hitherto little understood physiological functions, but by calling them "vires", he added no more to our understanding of them than Galen had done with his 60 functions; his observations alone were of value. Moreover, Haller's achievement was not such an innovation as Clark seems to suggest, for men such as Giovanni Argenterio of Castel-Nuovo had already impugned Galen's system in the sixteenth century, and reduced Galen's "faculties" not

just to three, but to one. Argenterio "stated that these spirits [i.e. faculties] were purely imaginary things, and that a single one was sufficient to explain the manifestations of life".[230] Besides, numerous other vitalists before Haller had been content with one "vis", for example Stahl, Wolff, and others. Herder, in declaring that Haller's "vires" are basically one, was simply following such earlier biological precedents. (We have seen that he must have met Wolff's ideas in the early 1770's in reading Haller's section on embryology.) But he thereby fell into the error of lumping together in name physiological functions which Haller had shown to be separate in reality.

Although in the Middle Ages, the doctrine of "faculties" encompassed all known functions of mind and body alike, it divided after the Renaissance into a medical or biological branch, in the tradition of Galen, and a psychological or rather philosophical branch, which we shall next examine. Haller did nothing new to overthrow the school of Galen; others had done as much before, and Herder was influenced by certain of these as well as by Haller. As we shall see, Herder also at an early date reduced to a common denominator the "faculties" of the Wolffian school of philosophical psychology, again following earlier precedents. No doubt this latter step encouraged him when he later reduced Haller's "vires" to one, for, as we have seen, he regarded them as psychic (i.e. psychological) rather than biological agencies in any case; besides, we know that it was his natural inclination to synthesise disparates. Thus, the two reductiones ad unum are indeed parallel, but only the attack on the Wolffians can be described as an attack on "faculty psychology" as such, which, by Herder's day, had completely lost its original contact with medicine and biology, with the comprehensive medieval scheme of "faculties" which had covered all the functions of the mind and the body.

B. The psychological "faculties".

We have already discussed those physical "faculties" or "compartments" of the brain which Herder rejected. We noticed that he thereby avoided the crude mechanism of thinkers such as Huarte, but that, at the same time, he failed to grasp the possibility that distinct areas of the brain, such as the cerebral cortex, may be associated with distinct and localised mental functions.

It now remains for us to examine the third sense of the word "faculties", as used in epistemology to designate logically distinct modes of mental activity.

Herder disliked the Wolffian psychology of the Enlightenment philosophers not only because it tended to ignore the importance of the senses and the empirical data of experience, but also because it portrayed the mind as essentially static. Mental "faculties", particularly sensation, cognition and volition, are for him not finally distinct abilities of the mind; they are only functionally different, i.e. they are various expressions of a basically unitary mind, whose character is revealed only in action, development, or „Würkung", and they can combine or shade off gradually into one another.[231] We have seen how he carried over this belief into his treatment of Haller's physiology, reducing Haller's "vires" to one „Kraft" or „Energie", and we noticed that, in physiology itself, such a step was neither new nor particularly valuable, since it distracted attention away from the exact observations upon which true physiology must rest. But in psychology the same procedure can have more interesting repercussions. Herder writes in his language essay of 1770:[232]

> Alle Kräfte unsrer und der Thierseelen sind nichts als Meta= physische Abstraktionen, Würkungen! sie werden abgetheilt,

> weil sie von unserm schwachen Geiste nicht auf einmal betrachtet werden konnten ---

This excellent observation, which still reflects Herder's more genuinely empirical views of the fourth „Kritisches Wäldchen" of the previous year, could have been the starting-point for a complete rejection of all „Kräfte" in psychology. Instead, Herder himself introduced and hypostatised further metaphysical „Kräfte" in the following years.

At this point, we should notice that he uses the word „Kraft" in psychology, as in the „Fragmente",[233] for example, before reading Haller's works. And although this word was used by Wolffian "faculty psychologists" to describe their "faculties", it is not in this sense that Herder uses it, for, as we know, he early rejected these "faculties". He uses it in a dynamic, Leibnizian sense, as part of a general philosophical vitalism which he borrowed chiefly from Leibniz himself, and he added Haller's „Kräfte" to it only at a considerably later date. This general metaphysical vitalism is more apparent in the 1774 and 1775 versions of his essay on psychology - Clark rightly notices that they represent "little more than the purely metaphysical phase of eighteenth century psychology"[234] - but, already in the 1775 version, Haller's „Reiz" figures fairly prominently, until, in the final version of 1778, Haller's ideas become the basis of the whole essay. Nonetheless, the metaphysical premise of a broad, Leibnizian vitalism is the same throughout.

However, we should first notice that, throughout his career, Herder continued to insist, as he did in 1770, that the traditional "faculties" are only abstractions from human behaviour. He had first said this as early as in 1767:[235]

> Die menschliche Seele verkennet überhaupt in ihren Würkungen die Abtheilungen der Kräfte, wie die Philosophen sie in ihr abgetrennet.

And in the fourth „Kritisches Wäldchen" of 1769, he rejects Riedel's „Grundkräfte", the supposedly permanent and independent "faculties" for perceiving beauty, truth, and goodness.[236] In this case, he is thoroughly justified, not because he substitutes one „Kraft" for Riedel's three, but because he replaces Riedel's threadbare metaphysical abstractions with an empirical analysis of how our judgements of beauty, etc., are developed by habit from our sense-experience.[237] (As Haym observes, Baumgarten, who emphasised the rôle of the senses rather more than most other Enlightenment psychologists, probably influenced him here.[238]) On numerous other occasions he repeats his assertion that the traditional "faculties" are only actively expressed modifications of the one basic „Kraft" of the mind (or soul, as he usually calls it), and that we are not justified in regarding the mind as fragmented or compounded of static, discrete divisions. A list of references to such passages, from 1770 to the time of the „Ideen", should suffice here, since nothing new is added to what we have already described.[239] The value of all these observations, we repeat, lies not in Herder's rejection of several „Kräfte" in favour of one, but in the corollary that all mental "faculties" are simply different responses of the individual to the data of experience. This can lead to truly modern and empirical observations, as when he says in the „Ideen":[240]

> Die Vernunft ist ein Aggregat von Bemerkungen und Uebungen unsrer Seele: eine Summe der Erziehung unsres Geschlechts, die, nach gegebnen fremden Vorbildern, der Erzogne zuletzt als ein fremder Künstler an sich vollendet.

A further advantage of Herder's opposition to faculties was that it made it possible for him to envisage certain kinds of behaviour which cannot adequately be described within traditional "faculty psychology". He is fond of describing such "mixed" reactions, and of showing how emotion can supervene in apparently rational processes of thought. Such ideas are especially valuable when he discusses the psychology of the artist. Already in 1764 or 1765, he speaks of „die Logik des Affekts".[241] In 1767, he talks of „anschauendes Erkennen", and says that artistic geniuses can think so well in terms of „Anschauung", „daß es fast scheine, daß sie mit der Vernunft empfänden".[242] And in 1769, he notes that the genius can perform several rational steps in one, although strict logic must not omit any of them[243] (compare Mephisto's remarks to the „Schüler" in „Faust"), while in his essay on Ossian, he speaks of the „sinnlicher Verstand und Einbildung" which manifests itself in folk-literature.[244] Observations of this kind were unusual before Herder, although there are certain precedents for them in the works of Rousseau and Hamann, and they greatly influenced the „Stürmer und Dränger", including the young Goethe. They are a necessary feature of the period of „Empfindsamkeit", but they only became possible through a weakening of the traditional philosophical "faculty psychology", which had tended to ignore such "mixed" processes of thought.

Related to all these observations are Herder's remarks, in his essay on language, concerning „Besonnenheit", which he names as the distinctive feature of the human mind, and which makes the use of language possible. This „Besonnenheit", which becomes active and conscious „Besinnung" as man learns to use language, consists in an ability to collect and learn from the data provided by the various senses, which are themselves mediated by hearing, the "middle" sense.[245] This, as Herder himself betrays, is

simply a modern version of the old Aristotelian doctrine of a "sensorium commune".[246] The data of experience are retained in the human consciousness, which has the ability to reflect upon them, to isolate any given impression, to generalise its experiences, and to translate them into a common language. But it is his remarks on the senses in particular which concern us here. He writes:[247]

> Wie hängt Gesicht und Gehör, Farbe und Wort, Duft und Ton zusammen? Nicht unter sich in den Gegenständen; aber was sind denn diese Eigenschaften in den Gegenständen? Sie sind bloß sinnliche Empfindungen in uns, und als solche fließen sie nicht alle in eins? Wir sind ein denkendes sensorium commune, nur von verschiedenen Seiten berührt - da liegt die Erklärung.

(Lehwalder makes some interesting remarks on this subject.[248]) Herder again refers to the same doctrine in his „Metakritik":[249]

> --- unser Inneres wird ein fortwährendes sensorium commune aller Sinne.

Thus, he reduces the senses to a common factor, just as he did with "faculties" in general, and with Haller's "vires" some years later. He believes that this basic unity of the senses distinguishes us from the animals, with their unintegrated instincts or „Triebe". We may conjecture that this same idea must have helped to produce his early and important theory of the "blending" of sight and touch as the child develops; for such a theory is possible only on the assumption that the senses are closely interrelated. We can thus appreciate how an ancient doctrine provided Herder with a new weapon for attacking the "fragmented" conception of the mind, and helped him to reach conclusions which, as L. Münz has shown in the case of "blending", are still of value today.[250]

It is of interest that Herder's friend Knebel uses the same idea in 1788:[251]

> Wir haben nur Ein Gefühl, das nach Verhältniß mechanischer Bestimmungen, zu welchen es die Nothwendigkeit der Eindrücke zwang, bald hört, bald sieht, riecht, schmeckt u.s.w.

Sömmering actually believed that the sensorium commune has a physical location in the "animated" cerebral fluid,[252] thus returning to the psychophysical approach of Aristotle, who located it in the heart.[253]

But despite all Herder's attacks on "faculty" psychology, he couched his remarks on human „Glückseligkeit" in the „Ideen" in such traditional phraseology that they elicited the following criticism, which is perhaps a trifle exaggerated, from Kühnemann:[254]

> Aber innerhalb dieses Gefühls [i.e. „Glückseligkeit"] unterscheidet er Sinnlichkeit, Einbildungskraft, Verstand, Empfindungen und Triebe als Beginn oder --- richtiger als Darstellungen des Willenlebens, ganz wie die gelernte Schulpsychologie sie unterschied. Ganz wie ihr ist auch ihm ein jedes dieser Seelenstücke eine reale Kraft; --- so wenig vertieft er die Einsicht in den Vorgang der Seelenprozesse.

In the „Journal" in particular, he uses the conventional language of "faculties":[255]

> Es giebt also eine eigne Gestalt des Gefühls von Wahrscheinlichkeiten, nach dem Maas der Seelenkräfte, nach Proportion der Einbildungskraft zum Urtheil, des Scharfsinns zum Witze, des Verstandes zur ersten Lebhaftigkeit der Eindrücke u.s.w.

In his scheme of education in the same work, as well as in parts of the „Ideen", the „Metakritik" and other works, he again uses the conventional language.[256] But we should add, in all fairness, that he usually uses

such terms only to designate functions of the mind in relation to its "genetic" development from sense-experience to the higher levels of reason and will.

Let us pause at this point for a few words on sources. It was from the school of Locke, not from physiology, that Herder took his arguments against "faculty psychology". A historian of psychology writes of Locke as follows:[257)]

> The mind is conceived of as having certain "powers" native to it. But there is only the one agent or person, who has ideas through the use of all the powers or faculties. These latter are simply its ways of acting. It may be aroused in the way of sensation or perception, in the way of memory, of imagination, of will, etc. This is Locke's refutation of the "faculty psychology" of Scholasticism, afterwards continued by Wolff [i.e. Christian Wolff].

Herder simply reapplied Locke's arguments, which he probably heard in Kant's lectures, to the neo-Scholastic "faculty psychology" of Wolff's school (although he did not go so far as to agree with Locke that the child's mind is like a blank sheet before it has been written upon,[258)] for Locke's picture of the mind was too inert for the Leibnizian and vitalist Herder). But there were other influences which could also have encouraged him to reject the archaic "faculties". Clark rightly mentions "Hamann's insistence upon the totality of the personality",[259)] as well as "Hemsterhuis' theory of the unitary personality" and "Spinoza's monism"[260)] in this connection. He also reminds us of Leibniz's "lex continui", which stated that there is an unbroken continuity between different modes of experience.[261)] We may also remember that Herder regarded the mind, like every other natural unit, holistically, as an organic whole whose parts are intimately related.

However, other thinkers of Herder's age shared his antipathy to Wolffian psychology. The materialist Hissmann, whose works Herder does not appear to have read, insisted in 1778 „daß man aufhöre mit der Verzettelung der Seelenkraft in unzählige Vermögen. - Daraus, daß wir psychische Erscheinungen als ‚Kräfte' bezeichnen, folge nicht das thatsächliche Vorhandensein der letzteren".[262] Unfortunately, as we have seen, the influence of Leibniz led Herder to believe that the metaphysical, vitalistic „Kraft" of the mind actually exists as such, and his own interpretation of Haller added more psychic, quasi-physiological „Kräfte" to his store, leading him ever further away from the relatively empirical position he had adopted in the fourth „Kritisches Wäldchen".

Herder's attacks on "faculty psychology" certainly cannot be applauded in every respect. Firstly, his idea that a single „Kraft" lies behind all mental activities encourages vagueness. As Hegel writes (quoted by Engels):[263]

> Hence --- in empirical psychology [we speak of] the forces of memory, imagination, will, and all the other faculties. All this multiplicity again excites a craving to know these forces as a single whole, nor would this craving be appeased even if the several forces were traced back to one common primary force. Such a primary force would be really no more than an empty abstraction, with as little content as the abstract thing-in-itself.

A modern writer makes a similar objection to such sweeping theories:[264]

> --- there is no a priori reason why these diverse characters of behaviour should depend on a single feature of the underlying mechanism: an over-simple model may hinder analysis.

There is a second major objection to Herder's condemnation of "faculties",

especially when he turns the old argument against Kant's critical philosophy. Schütze objects to Kant for the following reason:[265]

> Kant --- based his analysis of "reason" in his "Critique of Judgement", 1790, upon three "fundamental faculties" which are essentially identical with those accepted by Riedel. He contradicted in effect the idea on which rested Herder's philosophy of genetic individuality.

But such a statement rests on the false assumption that, if we say certain functions of the mind must always be logically distinct, as Kant did in his critical philosophy, we thereby deny that the individual can develop psychologically, from the empirical basis of experience. Kant's "faculties" are logically distinct functions in epistemology, not innate psychological "compartments" of the mind, such as less able analysts like Riedel, who failed to distinguish clearly between the logical and the empirical, between epistemology and psychology, had postulated. Götz rightly notices that Herder himself failed to distinguish between psychology and epistemology.[266] In fact, he writes as follows in the „Metakritik":[267]

> Das unziemende Wort Kritik der Vernunft verliert sich also in das anständigere, wahre: Physiologie der menschlichen Erkenntnißkräfte.

He therefore believed that the methods of logical epistemology and of empirical science are mutually exclusive. But logic and empirical investigation can and should be complementary. Epistemology analyses the logical conditions, limitations and forms of knowledge, whereas empirical psychology examines the actual mental processes and behaviour of the individual in relation to the causal world of experience. Kant used the language of "faculties" in epistemology, where it properly belongs; and although, from

the point of view of psychology, Herder was right to insist that "faculties" are only abstractions from behaviour, and to realise that they are thoroughly misleading, if treated as rigidly separate "powers" or „Kräfte", actually existing in independence of one another within the mind, he was not justified in using the same argument to attack Kant's epistemology, except where it was wrongly applied, like the "faculties" of the Wolffians, as a substitute for that very necessary empirical and scientific psychology which Herder himself had helped in some measure to promote. All this confirms our initial contention that, in Herder's day, empirical psychology and abstract philosophy were still imperfectly distinguished. They continually encroached upon one another's provinces, and, as in Herder's own philosophy, confusion was often the result.

e) Remaining features of Herder's psychology.

Herder's psychology was systematic only in so far as it rested upon Haller's vitalistic triad of „Kräfte", which, as Herder interprets them, lend a certain unity to his essay on psychology in 1778, and upon his rejection of "faculty psychology", which runs as a characteristic theme throughout all his writings on the subject. However, various of his isolated utterances touch upon other themes of interest in the history of psychology, and it is these which we shall now examine.

Clark speaks of Herder's supposed "associationism", which he borrowed, with his own variations, from the works of Priestley and Hartley.[268] In an interesting chapter of the „Ideen", to which Clark refers,[269] Herder writes of the thought-processes, and of those of the mentally deranged in particular:[270]

> Nicht wie die Fächer des Gehirns liegen, combinirt er [i.e. der Wahnsinnige], selbst nicht einmal wie ihm die Sensationen

> erscheinen: sondern wie andre Ideen mit seiner Idee [i.e. obsession] verwandt sind und wie er jene zu dieser nur hinüber zu zwingen vermochte. Auf demselben Wege gehn alle Associationen unsrer Gedanken: sie gehören einem Wesen zu, das aus eigner Energie und oft mit einer sonderbaren Idiosynkrasie Erinnerungen aufruft und nach innerer Liebe oder Abneigung, nicht nach einer äußern Mechanik, Ideen bindet.

He does not specify the principle according to which we associate ideas, whether according to repetition, synchronism, succession, similarity, contrast, contiguity, interest, etc. But he makes it clear that he does not believe that associations are physiologically determined („nicht wie die Fächer des Gehirns liegen"), or that they originate from external, empirical associations of experience („selbst nicht einmal wie ihm die Sensationen erscheinen --- nicht nach einer äußern Mechanik"). In fact, this is <u>not</u> that "empirical associationism" which Clark says he acquired from Hartley and Locke,[271] nor does it reflect the physiological (and materialistic) criteria of Hartley and Priestley. Hartley had written:[272]

> --- the Powers of generating Ideas, and raising them by Association, must also arise from corporeal Causes, and consequently admit of an Explication from the subtle Influences of the small Parts of Matter upon each other.

On the contrary, the whole purpose of the above passage in the „Ideen" is to show that the mind has its own peculiar nature, that an „innerer geistiger Mensch"[273] is formed, quite distinct from the visible body, and the chapter culminates, in truly dualistic style, in an argument for immortality founded upon the analogy of sleep.[274] If we had to find a designation for it, we should call this "idealistic associationism", similar only in name to the empirical equivalent of the British associationist school.

However, some of Herder's earlier utterances more closely resemble those of the associationists. He stresses the rôle of habit, just as Hartley and his school had done, in the fourth „Kritisches Wäldchen", although he had not read Hartley's work at that time. He says that our feeling for beauty results from „ein Habituelles Anwenden unsres Urtheils auf Gegenstände der Schönheit",[275] and, in a sermon of 1772, he goes so far as to say:[276]

> Unsre Denkart ist ja nichts, --- als die Summe der Eindrücke, der Vorstellungen, der Gewohnheiten unsers Lebens.

And in Part II of the „Ideen", as we have seen, he declares:[277]

> Die Vernunft ist ein Aggregat von Bemerkungen und Uebungen unsrer Seele.

Besides, we earlier noticed some other features of associationist psychology in his remarks on how the data from the various senses are combined (the equivalent of "simultaneous association") and on the intermixing of different modes of thought or "faculties". But all these remarks are thrown out without system, and, as we have seen, they contradict that "idealistic" theory of association which appears in Part I of the „Ideen". Accordingly, we can agree with the following remark of Götz:[278]

> Eine vollständige Associationstheorie finden wir bei ihm nicht.

Clark refers to Hartley as "one of the three men whose work may be said to have forced Herder out of his traditional uncertainty into the clarity of his Weimar period."[279] Yet Herder knew Hartley's theory of association already in 1772, near the beginning of his Bückeburg period, and he mentions it explicitly in a letter to Merck.[280] And we have seen that his theory of association, as expounded in the „Ideen", in "the clarity of his Weimar

period", is much less empirical than his earlier remarks in 1769 and 1772 on the same topic. It seems, in fact, that Clark has overrated the influence of Hartley, as well as that of Haller, upon Herder's thought.

Another interesting feature of Herder's psychological ideas is that he recognises the rôle of subconscious mental factors. In an earlier version of the „Ideen", Book VIII, he says of the philosopher:[281]

> --- er muß immer noch eine Menge dunkler Vorstellungen zugeben, die gleichsam im Grunde der Seele liegen, um immerwährend in unsre Neigungen und Urtheile unvermerkt aber desto kräftiger zu wirken.

As Siegel points out,[282] such ideas came to Herder from Leibniz, particularly from his posthumous "Nouveaux Essais", which Herder read in 1765. Hamann, in a letter to Herder in which he informs him of the publication of this important work,[283] already refers to Leibniz's "perceptions insensibles" (or "petites perceptions"), which undoubtedly influenced Herder's conception of the subconscious, as well as his idea that the transitions from sensation to emotion, reason, and will, etc. are gradual and almost imperceptible.

Other striking aperçus of Herder's include such remarks as the following:[284]

> Im Traum zeiget sich der Mensch ganz, wie er ist.

He later speaks of our „doppeltes Ich" in relation to dreaming, distinguishing „den träumenden und den Traumanschauenden Geist, den Erzähler und Hörer".[285]

We have already discussed another remarkable aspect of Herder's ideas on the psychology of perception, especially in the Weimar years. This was his theory of the „Bild", which we compared with modern „Gestalt" theories in our sections on perception and on optics. We may add here that the

same notion also appears in the „Ideen"[286] along with that "idealistic associationism" which we noticed above, as well as in the essay „Über Bild, Dichtung und Fabel".[287]

In our section on the "developmental method" or „Entwicklungsgedanke", we noticed a further feature of Herder's psychological ideas. For Herder, the individual personality, like so many other natural units, is constantly developing. (While discussing physical anthropology, we also saw that he uses the criterion of "perfectibility", i.e. of man's distinctive ability to develop mentally, as a means of distinguishing between man and the animals.) Around 1773, he says:[288]

Das Ich ist nie ganz.

Such ideas, of course, can largely be traced back to Leibniz's influence.

Let us conclude with a few remarks on Herder's influence on psychology. Probst says[289] that he had no direct influence upon the development of psychology proper, so far as can be ascertained, although Götz points out some similarities in the psychology of Wundt, and Schütze remarks upon the continuity between Herder's theories and those of Lotze.[290] It is not surprising that his ideas on the subject had relatively little influence, because the most valuable of his psychological theories appear in the fourth „Kritisches Wäldchen", which remained unpublished during his lifetime, and whose primary theme, the attack on the little-known Riedel, was not calculated to inspire initial interest. Besides, the rest of his writings on psychology, apart from the (in many ways valuable) essay on language, are characterised by that curious blend of empirical and metaphysical arguments which makes his theories so ambiguous and unsatisfactory. They were neither thoroughly scientific and physiological, on the one hand, nor were they calculated to contribute much to epistemology and abstract philosophy on the other.

However, Clark believes that the "characterology" or scheme of character-types, as set forth by Herder in the 1774 version of his essay on psychology, had a considerable influence on Goethe's „Werther", since all the characters in this novel fit into it.[291] But when we consider this scheme, which lists the psychological types of „Innigkeit" and „Ausbreitung" (corresponding roughly to the modern introvert and extravert), genius and non-genius, and pathological and non-pathological, with all their possible combinations, we realise that not only the characters in „Werther", but all characters, at all times and in all places, can be classified under one or other of these categories or combinations, which are therefore much too general to be related to any particular literary production. The theme of the man of genius in „Werther", as everyone knows, is all too typical of the period in which the work was written, and we do not need to look to Herder's rough scheme to explain why Goethe was interested in it. Besides, Clark himself admits that there is not a shred of evidence that Goethe had any knowledge of this draft of Herder's essay, and that the years 1773-75 were for them both a period of cool relations and of geographical separation.[292] Propositions of this kind are simply too general to be either proved or disproved, unless by the argument of post hoc, propter hoc.

Nonetheless, „Werther" is in many ways a psychological novel, as Clark believes. This reminds us that, in the eighteenth century, literature in general, especially the novel, often contributed more of value to psychology, at least in the way of observations on types of character and motivation, than did the more abstract and theoretical writings. But this merely corroborates our earlier contention that psychology was then still too little distinguished from abstract philosophy, whereas literature, as always, was more concerned with living experience. Until psychology became truly

empirical, literature fulfilled many of its functions. But Herder did tend to overestimate the importance of literature for psychology, as we shall see in the next chapter.

We may note in conclusion that Herder's division of character-types according to „Innigkeit" and „Ausbreitung" is not an original and inspired anticipation of the modern "introversion" and "extraversion". It goes back to earlier ideas, such as Burke's distinction between aesthetic emotions according to expansion and contraction, originally of the nerves, and especially to an observation of Pascal, which Herder himself relates to his own theory in 1778:[293)]

> deux sortes d'esprits, l'un de pénétrer vivement et profondément les conséquences des principes - l'esprit de justesse: l'autre de comprendre un grand nombre des principes sans les confondre, l'esprit de géométrie - was meistens auf meine erste Eintheilung von Innigkeit und Ausbreitung der Geistesgabe hinausläuft.

From our study of Herder's psychology, we conclude that, as in nearly all other areas of his thought, the „Kraft" conception greatly detracted from the scientific value of his ideas. His physiological and psychological „Kräfte" are predominantly qualitative and metaphysical, and since the mature Herder disliked most attempts to localise mental functions within the body, they can rarely be reduced to exact physiological processes. In his largest single contribution to psychology, the essay of 1778, he used Haller's physiological "vires" in an attempt to overcome the dualism of mind and body, and to follow Leibniz and Locke in amending the "faculty psychology" of the Enlightenment, with the more specific aim of showing that an unbroken continuity exists between all forms of consciousness, from the most

rudimentary physiological reaction to „Empfinden", „Erkennen" and „Wollen". But even in these aims, he was only partially successful, while his failure to understand Haller's exact observations, and the chronic vagueness of his metaphysical vitalism, jeopardised those empirical methods which he had set out to apply to psychology in his Riga years, but which he had already largely abandoned for a metaphysical, Leibnizian approach in the 1774 and 1775 versions of his psychology essay. It is to his earlier works, such as the fourth „Kritisches Wäldchen" and parts of the language essay of 1770, and to various aperçus scattered throughout his works, such as the „Ideen" and the essay „Über Bild, Dichtung und Fabel", that we must look for his best contributions to psychology. For in his most systematic work on the subject, the essay of 1778, his characteristic endeavours to combine conflicting ideas and methods by means of the „Kraft" conception ended, as usual, in contradiction and obscurity. Those who emphasise only one side of his aspirations, in this case his advocacy of empirical methods, give too one-sided a picture of Herder's complex and problematic nature.

4. Sociology and social anthropology.

Sociology does not figure as a distinct discipline in Herder's writings; indeed, it can scarcely be said to have existed as such in his day, far less as an established branch of empirical science. But several topics now associated with this subject, such as theories of cultural determinism, development, holism, dialectics and natural "laws" of social change, are indeed covered in his works, especially those on the philosophy of history, and we have already discussed them in the appropriate sections of the present work. Many of these ideas were indeed novel in Herder's age, and for this

reason, we can agree with W.H. Bruford's remark:[294)]

> --- it is undeniable that Herder is the first German sociologist of note.

The essay on language also raises some interesting sociological questions; we have examined the psychological premise of his theory of language, the idea of „Besonnenheit", in the previous section, and since the whole theme is bound up with the question of origins, we also touched upon it in our section on the so-called "genetic method", where we indicated that the problem of the origin of language is now recognised to be beyond the compass of empirical investigation, since no evidence is available on it, and that Herder's merit throughout the essay resides rather in the naturalistic principles he employs than in the theoretical conclusions he reaches.

His political theories, as enunciated in the „Ideen" and the „Humanitäts=Briefe" in particular, fall outside the scope of this study, since they are in no way related to science, but simply reflect his dislike for the politics of his age and his preference for more liberal forms of government than prevailed at the time.

Few other topics of interest to the philosopher and historian of science arise in Herder's works so far as scientific sociology is concerned.

He does, however, have a good deal to say on what is now called social (or cultural) anthropology. The following words from his notes for the „Journal", apart from their didactic and Rousseauistic overtones, show that his approach to the study of peoples has much in common with that of modern anthropologists:[295)]

> Ein Buch zur Bildung der Völker fängt bei lebendigen Beispielen, Gewohnheiten, Erziehung an und hört bei dem Schattenbilde

> trockner Gesetze auf. Es studiert alle Völker und die lebendigsten insonderheit, das sind die wilden, die halbwilden, die gesittet zu werden anfangen.

As Clark observes, Herder followed Kant's essay of 1764, „Versuch über die Krankheiten des Kopfes", in saying on another occasion that mental illnesses are less common in primitive societies than in those where the division of labour is far advanced, as in modern Europe.[296] Indeed, especially in his earlier years, he regarded the primitive mind as the prototype of the healthy psychological type, all of whose basic mental functions, particularly the "natural" emotions, are fully developed. He writes of primitive peoples in his study of „Ossian" and the folksong:[297]

> - über alle diese Schwächungen des Geistes seligunwissend, erfassen sie den ganzen Gedanken mit dem ganzen Worte und dies mit jenem.

Like their emotions, their powers of expression are simple, forceful, and healthy. However, in utterances like these, it is Herder's emotional interest in primitive poetry rather than his scientific curiosity that is at work.

On the details and sources of Herder's views on descriptive human geography and social and cultural anthropology, with his many excellent descriptions of various human societies and cultural phases in the „Ideen", the work of Grundmann is again recommended. The following words of Grundmann may serve to characterise this feature of Herder's writings:[298]

> Was Herders Völkerschilderungen so sehr vor allen anderen in dem Menschheitsgeschichten auszeichnet, ist die feinfühlende und scharfe Urteilskraft hinsichtlich der doppeldeutigen und sich vielfach widersprechenden Nachrichten einiger Quellen= schriftsteller, das bewundernswerte Kombinationsvermögen und

> die Fähigkeit, das Bedeutsame und Markante in dem Leben der Völker zu erfassen und meisterhaft darzustellen.

But since most of his writings on these subjects are purely descriptive, and, in the „Ideen", related to the ethical standard of „Humanität", they require no further mention in our study of the history of science. In dealing with Herder's theories of race and physical anthropology we have already discussed all those human phenomena which are relevant to our theme.

5. Economics and commerce.

Herder was always interested in commerce, especially in relation to history. Kant dealt with „mercantilische Geographie", among other topics, in his lectures on physical geography,[299] and no doubt stimulated Herder's interest in it from an early date. Moreover, Herder spent several of his happiest years in the flourishing Hanseatic city of Riga, where he counted among his friends numerous men who were actively engaged in commerce;[300] it was through the help of some of these that he was able to arrange his voyage to France and his stay in Nantes. And in his library, there were at least 30 volumes on commerce, finance and economics, many of them devoted to the history of commerce.[301]

The first important reference to these subjects in Herder's works appears in the „Journal", in which he points out that „Handelsgeist" alone is not enough to establish a nation's well-being, and refers to Holland in particular:[302]

> Da wird man sehen, wie der bloße Handelsgeist den Geist der wahren Staatsklugheit, Weisheit, Gelehrsamkeit u.s.w. aufhebt oder einschränkt --- Alles ist in Holland zu Kauf ---

For in the „Journal", and the „Auch eine Philosophie" of the Bückeburg period,

he attacks modern culture with its "mechanisation" of life and its deadening effects upon the natural virtues which are most common in primitive societies; he seems to see commerce as part of this harmful influence in the „Journal". Besides, as Rouché observes,[303] he later deplores the evil results of discovery and commerce among primitive native peoples, thus adopting the standpoint of Voltaire, Helvétius and Rousseau.

In the „Ideen", he emphasises the great importance of commerce in history, devoting to it a chapter which contains an excellent and concise history of European trade.[304] On this occasion, it is rather the civilising influence of trade, in Europe at least, which he stresses.[305]

But he neither himself suggests any formula for economics, nor does he take any clear-cut stand towards the economic systems of his century, such as mercantilism, physiocracy, and the emergent theory of economic liberalism. As Clark notices,[306] he believes that economic law is nothing more than the order of nature,[307] and applies to economic growth his "law" that less destruction occurs with time in history. He appears to think that competition, with honest attempts at co-operation, will enable commerce to fulfil its true mission of furthering the peaceful interdependence of nations:[308]

> Selbst der Gegenstand des scheinbar größten Eigennutzes, der Handel, hat keinen andern als diesen Weg [i.e. co-operation] nehmen mögen, weil er Ordnung der Natur ist, gegen welche alle Leidenschaften und Vorurtheile am Ende nichts vermögen. Jede handelnde Nation Europas beklaget es jetzt und wird es künftig noch mehr beklagen, was sie einst des Aberglaubens oder des Neides wegen sinnlos zerstörte. Jemehr die Vernunft zunimmt, desto mehr muß die erobernde eine handelnde Schiffahrt werden, die auf gegenseitiger Gerechtigkeit und Schonung, auf einem fortgehenden Wetteifer in übertreffendem Kunstfleiße, kurz auf Humanität und ihren ewigen Gesetzen ruhet.

Here, he seems to advocate a broad economic liberalism, without going into details or bringing out the harsher implications of the ethic of competition. In fact, his rather naïve views on economics are completely bound up with his ideas of „Humanität" and "laws" of progress, and appear to share their ambiguity - i.e. the progress of commerce is governed by natural laws, but it can also be affected by man's varying motives, and is subject to ethical criticism. Presumably, the "law" of economic progress will operate ever more effectively as the canon of enlightened self-interest becomes more widely accepted.

It is therefore clear that, although Herder believed that commerce is a potent force in human development, he subordinated his views on it to his wider philosophy of history, and contributed nothing to economics as a science. Thus we need devote no further attention to these subjects here, although we shall encounter some related topics when we come to discuss his views on the history of technology and inventions.

P A R T III:

The Place of Science in Herder's Thought and Herder's Place in the Scientific Tradition.

C H A P T E R I

The Place of Science in Herder's Thought.

Introduction: Herder's attitude to knowledge as a whole.

We have seen in our chapter on psychology how Herder believed that the traditional mental "faculties" are simply different functions of the unitary mind. It is therefore not surprising that he applies the same holistic doctrine to the object of the mind, to knowledge in general; in his opinion, the various branches of knowledge are merely different aspects of one basic whole. Accordingly, he writes as follows in 1781, in his prize essay „Über den Einfluß der schönen in die höhern Wissenschaften":[1)]

> --- das Reich der Wissenschaften scheint in allen seinen Gebieten eins zu sein wie die Kraft der menschlichen Seele: sie liegen einander näher oder entfernter, abgerissen und inselhaft ist aber keines, und zu allen ist Zugang.

Since, for Herder, everything which can be treated as a unitary entity is dynamic, and comparable with the living organism, it is understandable that, on another occasion in 1781, he uses an "organic" metaphor to describe the unity of knowledge:[2)]

> Insonderheit zeigt das Beispiel der meisten und ich möchte sagen, aller großen Männer, daß keine den Geist bildende Wissenschaft eigentlich von der andern abgetrennt sey, sondern alle einander helfen, alle auf einander weisen und wie mehrere Blumen aus einer Wurzel wachsen.

And in 1768, he actually names Bacon as a particular example of the „Poly=histor", for whom all knowledge is integrally linked.[3)]

In keeping with these beliefs, he consciously set out, at an early date,

to acquaint himself with all branches of knowledge. His youthful friend Kurella wrote many years later of the Herder he knew in Königsberg:[4]

> --- sein Umgang trug sehr viel zu meiner Ausbildung bei:
> denn er war schon damals eine lebendige Bibliothek.

Herder himself writes in 1764:[5]

> Ich sammle den Geist jedes Volkes in meine Seele!

And from this time onwards, his writings abound with ideas for works of a truly universal scope, such as a poem on all aspects of the human soul, which is already outlined in his notes of 1762 or 1763,[6] a „Geschichte des menschlichen Verstandes" in 1767,[7] and an „Universalgeschichte der Bildung der Welt" in 1769.[8]

It is obvious from these utterances that he adopted a historical approach to learning at an early stage of his life. The logical conclusion to his various aspirations was to undertake a universal, historical study of all human experience; in one of the more rhapsodic passages of the „Journal", Herder actually sets forth a plan of this kind, announcing that he intends to cover „die Grundsätze der Psychologie, und nach der Entwicklung der Seele auch der Ontologie, der Kosmologie, der Theologie, der Physik ---! aus allen eine Geschichte der Gelehrsamkeit und Wißenschaft überhaupt! und eine Geschichte der Menschlichen Seele überhaupt in Zeiten und Völkern!"[9]

Such enormous aims, which only a few individuals, such as Bacon, have entertained, could, even in Herder's day, be fulfilled only incompletely by any single individual. (The disappointment which necessarily follows this realisation is reflected, of course, in the opening monologue of Goethe's „Faust".) However, in relation to the amount of information available in his day, Herder went further than most men before or since his time towards attaining universal knowledge, and no important discipline of learning is

unrepresented in his extensive writings. In accordance with his belief that all subjects are related, he treated no single one in complete isolation, and preferred to sacrifice factual details and scrupulous accuracy rather than to let anything jeopardise those great syntheses of different areas of experience around which he hoped to construct his mathesis universalis. As we have seen, this overruling passion for reconciling all heterogeneous aspects of knowledge made it impossible for him to become an exact scientist, and the conception which, in most cases, mediated between whatever opposites he could not readily reconcile, namely the idea of „Kraft", deprived many of his scientific arguments of their value. Yet on the other hand, we did also discover that this same desire induced him to devise new methods of comparison and generalisation, many of which retain their value today.

It should already be obvious, in the light of earlier chapters, that Herder, as we should expect, did not treat science in isolation from the rest of knowledge. On the contrary, he is usually at such pains to reconcile it with philosophy, religion, etc., that it suffers considerably in itself. But since we have hitherto studied only his ideas concerning science and philosophy in greater detail, we shall now try to find out how he relates his scientific ideas to the other subjects and modes of mental experience which occupied him most, notably to history, education, religion, mysticism, and art. It is our contention that such an investigation might prove especially interesting today, since few individuals now find it possible to explore the connections between all the major branches of learning in the same way as did Herder, whose interest in the broader issues of knowledge was unusually highly developed even for his own day. Such broader issues are as relevant today as they ever were, although it is only recently that their relevance has been more forcibly impressed on our society by the ill

consequences of over-specialised education and the general fragmentation of learning. But before we proceed to examine the relationship between science and the rest of knowledge, we may well pause to consider Jean Paul's words on Herder's exceptional kind of erudition:[10)]

> Wenige Geister waren auf die große Weise gelehrt wie er. Die meisten verfolgen nur das Seltenste, Unbekannteste Einer Wissenschaft; er hingegen nahm nur die großen Ströme, aber aller Wissenschaften in sein himmelspiegelndes Meer auf ---

1. Science and history.

Since we have already seen how Herder attempted, with his supposed "natural laws" of social change and historical progress, to apply science to history, it only remains for us, in studying the relationship between these two disciplines in his thought, to ask how he applied history to science, i.e. what part he considered science has played in human history.

a) The history of science.

As we know, Herder adopted a historical approach to knowledge as a whole. He used the same method in studying most individual subjects, including science itself. For example, even the early, unpublished manuscripts on mathematics, described in an earlier section, as well as the Riga manuscript „Anfangsgründe der Sternkunde", are preceded by fairly full introductions tracing the history of the sciences concerned.[11)] And, although few works devoted exclusively to the history of science were available in his day, he acquired Bailly's histories of the astronomy of the ancients and that of India and the Orient (1777 and 1787),[12)] Weidler's history of astronomy (1741),[13)] Gmelin's history of chemistry (1797),[14)] Murhard's

history of physics (1798),[15] Priestley's history of electricity (1772),[16] Kästner's history of mathematics (1796),[17] and numerous works on science in the ancient world and by ancient scientific thinkers.[18]

Many references to the history of science appear in his published writings, showing that he did study in detail works such as those listed above. He realised that the beginnings of scientific thought are to be found in the mythologies of ancient and primitive peoples,[19] but, in the „Ideen", he rightly says that the beginnings of science as we know it are to be sought in ancient Greece.[20] The following words from the „Ideen" are still applicable:[21]

> Wer indessen den Griechen den Geist reiner Wissenschaft abspricht, möge ihren Aristoteles und Euklides lesen --- denn auch das war Platons und Aristoteles Verdienst, daß sie den Geist der Naturwissenschaft und Mathematik erweckten, der über alles Moralisiren hinaus ins Große geht und für alle Zeiten wirket.

His essay of 1776 on Copernicus shows detailed knowledge of ancient astronomy and of the theories of the Alexandrian school; he cites the opinions of Apollonius of Perga, Pythagoras, Philolaus and others, and correctly maintains that all the elements of Copernicus' heliocentric theory were already present in antiquity.[22] He shares the opinion of his century, now accepted with more qualifications, that science almost disappeared from Europe in the Middle Ages,[23] and notices that Scholastic philosophy was an obstacle to empirical investigation.[24] His genuine appreciation of the significant Islamic contribution to medieval science was somewhat less typical of his times, and, in the „Ideen", he lists the most important scientific achievements of the Arabs in some detail.[25] He concludes:[26]

> Ohne Araber wäre kein Gerbert, kein Albertus Magnus, Arnold von Villa Nova, kein Roger Baco, Raimund Lull u.a. entstanden ---

It is also noteworthy that, in 1772, he observes that post-Reformation science and philosophy encouraged „Freidenkerey".[27] And finally, he appears (in the „Ideen") to share Bacon's belief that knowledge must continually increase, but, unlike the English savant, he does not seem to believe, at this date, that it will ever be complete; such views as the following are indeed familiar to modern readers:[28]

> Wir also können in diesem einmal begonnenen Lauf nicht mehr stehen bleiben: wir haschen dem Zauberbilde einer höchsten Wissenschaft und Allerkenntniß nach, daß wir zwar nie erreichen werden, das uns aber immer im Gange erhält, solange die Staats= verfassung Europas dauret.

He obviously realises that this dynamic growth in learning is primarily a European phenomenon.

Before we go on to evaluate his ideas on the history of technology (a topic more frequently discussed in his age than the history of pure science), we may conclude that he was interested in the history of science, in its widest sense, including its theoretical aspects, to a greater extent than most thinkers of his times. He thus contributed something to a subject which only today is finding its place as an established discipline in the learned world. He understood how important science is in human history, and in European history in particular, and traced the scientific tradition from Greece, and even from earlier civilisations, down to his own times. It was his characteristically historical approach to learning which led him to such conclusions, and we can detect his influence when Goethe writes as follows in his „Farbenlehre" of 1807:[29]

> --- so läßt sich hier auch wohl behaupten, daß die Geschichte der Wissenschaft die Wissenschaft selbst sei.

b) The history of technology or applied science.

Throughout Herder's writings, we encounter references to the history of technology, particularly to those great mechanical inventions which, as he and a few others before him realised, have profoundly affected human history. Thus, in the „Journal", he refers to the invention of the vacuum-pump, etching, the telescope, the compass and other devices,[30] and in later works, he mentions the application of mathematics to mechanics,[31] the inventions of printing, the Arabic numerals, modern musical notation, clocks, oil-painting, and other technical advances, all of which he regards as important historical events.[32] Many other inventions, such as Greek Fire, are listed in his classified notes for the „Ideen".[33]

But apart from factual observations of this kind, he makes theoretical pronouncements on the history of technology in various of his works. Herder maintains in his „Auch eine Philosophie", as Rouché[34] points out, that fortuity helped just as much as human ingenuity to produce great inventions, and Roy Pascal[35] remarks that Herder, at this time, sees inventions as proving the irrationality of historical development. In fact, in his essay on Winckelmann in 1777, he writes:[36]

> --- die gerühmtesten Erfindungen sind nur Blitze, die aus dem Reiben der vorbereitetsten Umstände und gleichsam Vorerfindungen trafen, und auch bei ihnen findet der Mensch viel öfter als er erfindet.

And in the „Ideen", Part II, he says that great inventions come about „meistens durch eine kleine Zusammenrückung zweier lange bekannter Gedanken",[37]

while already in the manuscript „Anfangsgründe der Sternkunde" of 1765, he (rightly) observes that the telescope was discovered by chance.[38)]

As Rouché[39)] observes, however, Helvétius, Hume, Voltaire and Bacon had earlier declared that chance (or intuition) can produce great inventions or discoveries. We may add that, in a work[40)] referred to in Herder's classified notes[41)] for the „Ideen", it is stated that the Chinese would not have invented so much „wenn es ihnen ein glücklicher Zufall nicht vor die Nase gelegt hätte." Goethe too once wrote:[42)]

> Zum Entdecken gehört Glück, zum Erfinden Geist, und beide können beides nicht entbehren.

But Rouché further says of Herder's „Auch eine Philosophie":[43)]

> --- elle montrait dans l'acquisition de la science un présent de Dieu.

Realising how unpredictable technological inventions in history appear to be, Herder does indeed apply to them a more teleological, providential interpretation than to most other historical phenomena. Even in the „Ideen", Part II, he writes:[44)]

> Vielleicht ist keine Geschichte, die so augenscheinlich die Regierung eines höhern Schicksals in menschlichen Dingen zeigt, als die Geschichte dessen, worauf unser Geist am stolzesten zu seyn pflegt, der Erfindung und Verbesserung der Künste. Immer war das Merkmal und die Materie seiner Bezeichnung längst dagewesen: aber jetzt ward es bemerkt, jetzt ward es bezeichnet.

He adds shortly afterwards:[45)]

> --- das alles gehört zur obern Haushaltung Gottes mit unserm Geschlecht ---

Statements of this kind are unusually teleological for the mature Herder, although, as we know, he did not finally abjure teleology until he wrote Part III of the „Ideen". However, we must recall what his teleological arguments entail. They do not require miraculous intervention to reinforce them, and he postulates such divine intervention only in explaining historical beginnings or first causes. Historical developments, as he sees it, can be interpreted both naturalistically and teleologically, for purpose and providence emerge only in causal changes governed by what he calls "natural laws". The unexpectedly great part played by chance in many great technological discoveries and inventions led him to invoke relatively undiluted teleology in this case, since, if he had conceded that fortuity alone produced them, he would have removed an important buttress from his doctrine of ultimate progress in history.

Birkner, more than other critics, has dwelt upon another feature of Herder's theory of technological inventions as set forth in his „Auch eine Philosophie":[46)]

> Nach Herders Meinung findet der Mensch nur allzu leicht Genüge im mechanischen Gebrauch des einmal Erfundenen.

Herder, in fact, traces much of the "mechanisation" he then deplored in modern culture to the spread of mechanical aids among the ignorant masses, who thus lose contact with the fuller and more "natural" existence they formerly enjoyed. He writes:[47)]

> Gewiße Tugenden der Wißenschaft, des Krieges, des Bürgerlichen Lebens, der Schiffahrt, der Regierung - man brauchte sie nicht mehr: es ward Maschiene, und die Maschiene regiert nur Einer.

Thus in this work, he does not share Bacon's belief that only unmitigated

advantages can accrue from technological progress. But in his later works, he insists less on this Rousseauistic idea. He singles out the mechanical sciences for especial praise in an essay of 1781, saying with reference to their obvious utility and their freedom from the controversies which beset so many other subjects:[48]

> Sie sind der Wald, der immer grünet ---

Yet in the „Ideen", he dilates upon the evil as well as the beneficial effects of mechanical inventions, and notes that, while inventors are few, the fruits of the advanced civilisation they help to create are unthinkingly enjoyed by masses who have no intrinsic claim to be called civilised themselves.[49] And finally, later in the same work, he says that even the abuse of mechanical inventions, such as gunpowder,[50] must eventually produce good results,[51] and thus reconciles his earlier, more pessimistic views on the history of technology with his later historical optimism:

> So arbeitet sich auch in den Kräften des Menschen der über= treibende Misbrauch mit der Zeit zum guten Gebrauch um ---

Thus, for Herder, mechanical inventions can produce both good and bad results. As Birkner writes:[52]

> „Die Erfindungen des menschlichen Geistes" sind also weder gut noch schlecht, erst in der Anwendung zeigen sie ihren Charakter.

The same critic notices how Herder often balances his praise for some great invention with remarks on its possible evil consequences.[53] Technology is only a means, and can be used to serve many different ends, as he sees it, but it is with man that the choice between good and evil applications lies.

We conclude that, apart from the more unqualified historical optimism

of his later period, Herder's remarks on technology are very relevant to the situation today, and although some of them may now sound like truisms, they were not so in the pre-industrial Germany of the eighteenth century. He combined Bacon's insight into the benefits conferred by technology with Rousseau's concern over their undesirable repercussions upon social life, and is accordingly closer to the opinions of most present-day thinkers than were either of his great, but more one-sided predecessors.

All in all, whether the results of technology be good or bad, he regarded it as an extremely potent force in history. In 1774, he notices how inventions such as the telescope, gunpowder, the compass, and printing altered the whole course of human development.[54] (He probably emphasised printing in particular in his „Auch eine Philosophie", exclaiming that anyone using it to the full as a medium for disseminating his ideas can become a „Sokrates unsrer Zeit",[55] because he had himself found the direct „Wirkung" he wanted to exercise in society impossible for him in Bückeburg, and discovered a partial substitute for it in authorship.) In the „Ideen", he stresses the need for a „Geschichte der Erfindungen", thus renewing Bacon's appeal for a "History of the [mechanical] Arts".[56] Like the economic theorists of history in the nineteenth and twentieth centuries, he declares that the domestication of the horse[57] and the transition from pastoral to agricultural society[58] were vital stages in man's development. In 1797, he lists inventions and „Revolutionen der Erde" (presumably great geological events) as mainsprings of human change,[59] and Roy Pascal notices how, in 1774, he treats major inventions and the greatest historical occurrences as equally important.[60]

But Herder's belief that technology is a powerful influence in history should not be thought of as completely anticipating the economic or

materialistic theory of history. For we have seen that he also uses teleological and other arguments whenever it suits him. He was really reviving the ideas of Bacon, who profoundly influenced his thought (for example, it was Bacon who first pointed out the momentous historical repercussions of printing, gunpowder and the compass[61]), although, as we have seen, this Baconian optimism about the social effects of technology is tempered by an almost Rousseauistic pessimism in Herder's first work on history in 1774. We shall return to Bacon's ideas later, but meanwhile, we may observe that the following words from the „Ideen" unmistakably betray his influence upon Herder's interest in technological progress:[62]

> --- wenn wir erwägen, daß fast alle Erfindungen unsres Geschlechts in sehr junge Zeiten fallen und beinahe keine Spur, keine Trümmer eines alten Gebäudes oder einer alten Einrichtung vorhanden ist, die nicht an unsre junge Geschichte geknüpft sei; welche Aussicht giebt uns diese historisch=erwiesene Regsamkeit des menschlichen Geistes in das Unendliche künftiger Zeiten!

c) The further progress of technology.

Herder indulged in some interesting speculations concerning the future progress of technology. He declares in 1774 that the technical means of warfare have already reached an advanced stage of development; such ideas were perhaps brought home to him by the often tedious conversations to which he had to submit with his current patron, the militaristic Count of Schaumburg=Lippe. In his „Auch eine Philosophie", he writes:[63]

> Wenn [sic] hat man mehr Macht und Maschienen gehabt, mit einem Druck, mit einem Fingerregen ganze Nationen zu erschüttern?

In Part III of the „Ideen", he claims that technical improvements in warfare will make war more dispassionate and impersonal, hence increasingly unlikely

to occur.[64] But in 1793, with the menace of the French Revolution spreading over Europe, he writes less optimistically:[65]

> Ein Conflict aller Völker unsrer Erde ist gar wohl zu gedenken: der Grund dazu ist sogar schon gelegt.

All these utterances are particularly striking for the modern reader. The opinion set forth in the „Ideen" that ever more powerful weapons will make war less and less likely to break out reminds us, in a somewhat ironical way, of the modern doctrine of peace through a balance of "deterrents". But Herder was not such a visionary as this would suggest; his friend Einsiedel, radical as ever in his views, actually suggested (in the 1790's) that delayed-action combustibles such as phosphorus, poisons, poisoned shrapnel, and even „Pestmiasma" should be used as a means of making warfare less likely to benefit the aggressor, and consequently less likely to be resorted to at all.[66] Discussions with this remarkable anarchist and eccentric doubtlessly led Herder to believe that war becomes decreasingly likely, but, as we have seen, he modified his ideas after the French Revolution, even suggesting that a world war may at some time break out.

Some further suggestions on future technological developments appear in Herder's works. For example, he regrets in 1803 that recently discovered scrolls, written in antiquity, cannot now be unrolled, and adds:[67]

> --- zu wünschen wäre es gleichfalls, daß eine chemische oder andre Erfindung die Mühe des Aufrollens verkürze und ihr abhelfe.

Chemical means are available for this very purpose today. Furthermore, Bärenbach and Hansen[68] have drawn attention to a passage in the „Journal" in which Herder's suggestions again seem to anticipate modern advances; he writes of the „neue Erde" beneath the sea:[69]

> Welcher Kolumb und Galilei kann sie entdecken? Welche urinatorische neue Schiffahrt und welche neue Ferngläser in diese Weite sind noch zu erfinden? --- [etc.]

A. Gillies furnishes several interesting details concerning the history of submarine navigation in a scholarly note to the above passage in his edition of the „Journal",[70] and from this, it emerges that Herder was by no means the first to put forward such suggestions. We may confidently add here that he had already encountered ideas of this kind in Kant's lectures on physical geography, because, in a plan drawn up for these lectures in 1757, Kant proposed to speak „vom Senkblei und der Täucherglocke" and to mention „Methoden, versunkene Sachen in die Höhe zu bringen".[71]

From all this, we conclude that Herder was interested in the future as well as the past history of applied science, and that the striking speculations in which he indulged are a mixture of pure fancy, of ideas thrown out by earlier thinkers, and of bold conjectures about what might eventually develop from the resources of technology as they appeared in his day.

Nothing need be added here to what we have already said concerning the relationship of science and history in Herder's thought. We have said enough to show not only that he tried to apply science to history with his "natural laws" of social change, but also that he applied history to science, thereby establishing the closest of links between the two disciplines, in accordance with his own belief that all knowledge is necessarily interconnected, and with the modern idea that we should try to establish links between hitherto divorced branches of learning. We may fittingly terminate this section with the words of our own century's greatest historian of

science, George Sarton:[72]

> The prehistorians and other archaeologists have built a solid bridge between history and science, and we, historians of science, are now proceeding to build another one, even more substantial, and thus help to span the chasm which is cutting our culture asunder and threatening to destroy it. The scientific spirit is as much improved and purified by the admixture of historical considerations as is humanism itself by the introduction of scientific methods.

2. Science and education.

More than most other thinkers of his age, an age in which classical and theological traditions of learning were still predominant, Herder believed that natural history and science are essential ingredients of every secondary school curriculum, and of the ideal general education. At the „Domschule" in Riga, he himself taught natural history and geography,[73] as well as mathematics and astronomy.[74] His letters to the ducal family of Weimar show that he tutored the crown prince of that state, Karl Friedrich, in natural history, geography, mathematics, general science and the history of science,[75] and we have already seen from his „Schulrede" on geography how indispensable to secondary education he considered this subject to be.[76] Moreover, he planned to write „ein --- natur=historisches Lesebuch für die niedern Schulen", as Caroline informs us, and in it, he intended to present younger children with „richtige Begriffe von den ihnen zunächst liegenden natürlichen und ökonomischen Dingen, von nützlichen oder schädlichen Thieren und Pflanzen, vom Menschen, von Naturerscheinungen, und etwas allgemein Verständliches von der Naturlehre".[77] And on various occasions in his

writings, he considers the value for schools of works on natural history and science by such men as Buffon,[78] Büsching,[79] Euler,[80] Hoffmann,[81] Kästner,[82] Maupertuis,[83] Newton,[84] Réaumur,[85] Rösel,[86] Rothe[87] and Swammerdam.[88] In fact, in order to appreciate how great his interest in scientific education was, we need only recall that all of his sons who survived until maturity chose practical or scientific careers, namely medicine, mineralogy, commerce, estate-management and forestry.[88a]

But it was in the teaching of natural history that he was most interested. As early as in 1765, he writes:[89]

> Die Naturgeschichte ist das Feld, das nach vielen neuern und sehr gründlichen Erziehungsplanen [sic] vielleicht am allermeisten unter den Schulwißenschaften, das Genie entwickelt, die Augen schärft, von einem zum andern überzusehen, ein Feld was die Aufmerksamkeit der Kinder einzig und allein vorzüglich beschäftiget ---

The special merit of natural history is that, as a concrete and realistic study, it is admirably suited to capturing the attention of younger children. Buffon perhaps encouraged Herder in this idea, for the great French naturalist had written:[90]

> --- l'Histoire Naturelle doit leur [i.e. aux jeunes gens] être présentée à son tour, et précisément dans ce temps où la raison commence à se développer --- rien n'est plus capable de rabaisser leur amour propre, et de leur faire sentir combien il y a de choses qu'ils ignorent.

But it was Kant, in his lectures on physical geography, who most forcibly impressed upon Herder the outstanding need for more concrete studies, such as natural history and geography, during the formative period of the youthful mind. Kant wrote in 1765, while Herder was studying under him:[91]

> Als ich gleich zu Anfange meiner akademischen Unterweisung erkannte, daß eine große Vernachläßigung der studirenden Jugend vornehmlich darin bestehe, daß sie zu frühe vernünfteln lernt, ohne gnugsame historische Kenntnisse, welche die Stelle der Erfahrenheit vertreten können, zu besitzen: so faßte ich den Anschlag, die Historie von dem jetzigen Zustande der Erde oder die Geographie im weitesten Verstande zu einem angenehmen und leichten Inbegriff desjenigen zu machen, was sie zu einer praktischen Vernunft vorbereiten --- könnte.

As Herder himself believed, younger minds may be incapable of grasping the abstractions of pure science, yet the many curious and tangible details of natural history rarely fail to intrigue them. We already know that he thought that all development should be natural or "organic", and that the human senses and emotions should be cultivated before the abstract reason comes into play. In this respect, natural history is invaluable, providing an agreeable introduction to science as a whole.[92)]

In the „Journal", Herder draws up a fairly detailed plan for a realistic course in the secondary school, intending to apply it in Riga at the „Lyzeum", the headship of which institution he hoped before long to obtain. The three „Realklassen" for which he outlines a curriculum begin with one which is adapted to the needs of younger children, and natural history, of course, is specially emphasised.[93)] Natural history must be related to daily life, to household commodities such as coffee, tea, sugar, spices, bread, beer and wine. Herder adds:[94)]

> Hier kommen lebendige Sachen und Kupfer zu Hülfe --- hier wird alles lebendig.

He does not abandon his customary historical approach either, for he includes „Geschichte der Künste, der Handwerke, der Erfindungen" in the time-table of

this class. Mathematics should be taught at this early stage only in relation to practical, applied science, which can be readily illustrated by examples such as sound, colours, water, air, machines and the like. In short, his aim is as follows:[95]

> --- es wird Hauptzweck, dem Knaben von alle Dem lebendige Begriffe zu geben, was er sieht, spricht, geniesst, um ihn in seine Welt zu setzen, und ihm den Genuß derselben auf seine ganze Lebenszeit einzuprägen.

In the second „Realklasse", the pupil is introduced to „Naturlehre" or to science proper.[96] Instruments and experiments are essential (Herder intends to procure „einen Schatz von Instrumenten und Naturalien" for the school), and the pupils should study physical and human geography, again with many concrete illustrations.[97] Mathematics should still be taught in conjunction with applied (physical) science, which must include astronomy, chronology, optics, hydrostatics, mechanics, etc.[98] (The latter list is already familiar to us from Herder's early manuscripts on mathematics, and Kant's influence is again marked.) The scientific subjects covered in the third „Realklasse" include pure physics and pure mathematics, and natural history now deals with systems of classification.[99] (Herder here names the „Kette der Wesen" or Chain of Being.) Natural philosophy and the works of the great scientists of the age are introduced, and the pupils round off their study of geography with a review of its general implications.[100] They should never lose contact, however, with practical things, but should look into trades, inventions and technology at first hand.[101] Herder sums up the whole programme in terms of the traditional psychological "faculties", but we should understand these, of course, in the light of his own "organic" and developmental psychology, not in that of the Wolffian "faculty

psychology". The three classes represent stages of mental development from „Sinn und Gefühl" to „Phantasie", and finally to „Vernunft".[102)]

Other subjects, such as languages, history and religion are also included in the curriculum, we need scarcely add. However, what is really remarkable about it is that science is allowed to stand on an equal footing with these more traditional subjects. The entire conception is closer to that of a modern „Realgymnasium" than to those of the usual secondary schools of Herder's times. And although we can in part explain his preoccupation with science by saying that he wished to cater for the exigencies of practical life in Riga, we should also notice that, in 1773, he says that utility must never be the main motive behind education.[103)] He sought a balance between theory and practice, and he maintains in 1781 that the „schöne Wissenschaften", which help to develop our senses and our tastes, must be studied before the „höhere Wissenschaften", the abstract disciplines of knowledge, otherwise the latter will have no solid foundation. Indeed, he believed not only that the concrete and the abstract, the senses and the reason, and natural history and pure science should complement one another, but also, as befitted one who regarded the mind and all knowledge as unified wholes, that arts and sciences are equally necessary in an ideal education.

3. Science and religion.

a) The influence of religious standards on science, as encountered so far.

In dealing with the various meanings of Herder's „Kraft", with his ideas on teleology, chronology, diluvian theories in geology, the origin of man, immortality and "ideal" theories of evolution, the relationship of the soul

and the body, and a few other topics, we have seen how he tries, on various occasions, to reconcile science and religion. In most cases, he does not attempt to impose orthodox theology or a literal interpretation of the Scriptures upon scientific observations and hypotheses. He usually tries, especially with his idea of „Kraft", to modify both standards of truth and to reconcile them through a common metaphysical factor, without subordinating either of them completely.

But although both religious and scientific standards are frequently distorted, especially by the „Kraft" idea, some of the beliefs we have named, for example his "immanent" teleology, simply add a complementary religious or providential interpretation to what is described first and foremost as a natural, causal process, and others, like the belief in a divine first cause and in the immortality of the soul, deal with questions which, by their very nature, cannot be answered by science, and cannot therefore come into direct conflict with it. They can offend scientific standards only indirectly, by misusing inductive methods to "prove" something upon which no empirical evidence can have any bearing. However, others again, like his belief that the Book of Genesis contains an acceptable account of the creation of man, or his (albeit vacillating) belief that the Noachian Deluge actually took place, compete with naturalistic ways of accounting for phenomena upon which empirical evidence is, at least in principle, available. These latter beliefs trespass directly upon the province of science, substituting Scriptural texts for empirical enquiry, and it is over questions of this kind that most of the great battles in the past between science and religion have been fought. However, we have seen that few religious beliefs of this kind appear in Herder's writings on science, and that those which do appear were

ideas commonly accepted by most thinkers of the age. As Günther writes in his history of anthropology:[104]

> Selbst Aufklärer vom reinsten Wasser gaben dem biblischen Berichte den Vorzug vor den anderen damals bekannten Schöpfungsberichten, weil er auf die Schilderung von „Götter= und Halbgötter=Äonen" verzichtete.

All in all, we have seen that metaphysical, mystical, aesthetic and emotional postulates distorted Herder's scientific ideas far more than did traditional Christian orthodoxy.

However, until he more outspokenly embraced rationalistic and radical views in the late 1780's, Herder did profess that both religious and scientific truths are equally important, declaring, for example, in 1781, after Bacon:[105]

> Die wahre Wissenschaft ist, wie die Wasser, eines doppelten Ursprungs: vom Himmel und von der Erde: jenes ist die Theologie, dies die menschlichen Wissenschaften.

But since we have already studied his individual scientific ideas, we shall now examine some of his central theological beliefs, in order to determine whether they are in themselves opposed to naturalistic or scientific principles, and to decide how orthodox his personal religion was.

b) The influence of naturalistic standards on theology.

First of all, let us consider Herder's attitude to the doctrine that the Holy Writ is divinely inspired, or the doctrine of „Theopneustie", as Herder himself calls it.[106]

In some of his early sermons, he explicitly accepts the doctrine. For example, he says in a sermon of 1765 of the miracle of Pentecost:[107]

--- es besiegelte die Eingebung der Göttlichen Schriften.

Yet already in 1768, in another sermon, he tries to combine the doctrine of literal inspiration with natural psychological causes, emphasising now the one, now the other, throughout the sermon. Thus, he first tells us:[108]

> Sie [i.e. divine grace] brachte entweder im Traume oder in einer wachenden Erhebung der Sinne Bilder vor das Auge ihrer [i.e. the Biblical writers'] Einbildungskraft und heftete ihre Aufmerksamkeit auf dieselben. So entstanden Gedanken in ihrer Seele und mit den Gedanken sogleich Worte ---

Shortly afterwards, he says:[109]

> --- ich müßte den Augenblick das Wesen meiner Seele vernichten können, wenn ichs erwarten wollte, daß Gott in die Reihe meiner Gedanken Zwischengedanken einschieben [wollte].

He later goes even further, saying:[110]

> --- alsdenn werden die Empfindungen deines Herzens reden, --- denn [sic], und anders nicht, redet der Geist Gottes in dir.

And finally, after various attempts to explain it, he concludes that the way of inspiration is unknown:[111]

> Derselbe Allwissende, der auf eine uns unbekannte Art ihre [i.e. the Biblical writers'] Seelen in seiner Hand hielt, damit sie aus dem Grunde derselben das hervordachten, was sein Wille war --- [etc.]

But in a fragment written in the following year, and entitled „Über Moses", he is much more radical, calling Moses' dialogue with God „eine Monologe mit sich unter dem Namen Gottes".[112] In the Bückeburg years, however, he returns to that hybrid theory of divine inspiration and natural expression he had put forward in 1768:[113]

> Freilich musten auch in der Seele oder im Gehirn Johannes Bilder bereit liegen, die Gott zu dieser neuen Offenbahrung weckte ---

But in 1780, in the „Briefe, das Studium der Theologie betreffend", he writes of the Old Testament prophets:[114]

> --- die Worte, die sie sprachen, kamen aus dem Drang ihres Herzens und also aus veranlassenden Zeitumständen; die Gestalt, die sie in der Reihe der Zeiten hatten, sahen sie nicht, sah oft ihre Zeit nicht; dies erblickte erst die Zukunft.

He tries in his „Vom Geist der ebräischen Poesie" in 1783 to portray the prophets as men who predicted the future from the ordinary, available evidence of the past and present, yet calls this natural, historical development „die künftige Zeit der Regierung Jehovahs".[115] By the same reasoning, he tried in the „Ideen" to show that history is both a natural process and a moral order or providence. But most noteworthy of all, in an earlier manuscript for the „Ideen", he says of the means by which the creator communicated with newly created man:[116]

> Nicht durch Engel und Wunderstimmen sprach er [i.e. der vorbildende Verstand Gottes] zu ihm: sondern durch sichre deutliche bleibende Wunderwerkzeuge, die Thiere ---

(In another discarded manuscript for Part II of the „Ideen", written in 1784 or 1785, he writes that religion is the „Produkt" (erased) then „Bedürfniß der Menschheit", and that it was „erfunden" (erased) then „modificirt" by man.)[117] Man, that is, learnt by imitating the animals. Finally, in 1798, he abandons all attempts to combine the natural and the supernatural, saying:[118]

> Die Verschiedenheiten, ja die Widersprüche der Evangelien selbst bezeichnen den eignen Standpunkt jedes Evangelisten so augen=

> scheinlich, daß unter der Maske eines einhauchenden Geistes sich in ihnen nichts erklären läßt ---

He now secularises the word „Offenbarung" completely:[119]

> --- wer eine Wahrheit hell ans Licht stellet, der offenbaret.

From all this, we conclude that the development of Herder's beliefs concerning the inspiration of the Scriptures bears witness from the start to the influence of naturalistic modes of thinking upon theological doctrine rather than vice versa, and that his attempts at compromise were never permanent or satisfactory, even to himself. For this situation, the idea of environmental determinism in psychology, already familiar to us from his scientific writings, is chiefly responsible.

Herder's attitude to miracles in general follows a similar pattern. In the „Journal", in 1769, he calls for „eine Genetische Erklärung des Wunder= baren und Abentheuerlichen aus der Menschlichen Natur".[120] Yet in 1773, in Bückeburg, he appears to believe in miracles, although such statements as the following are not entirely unambiguous:[121]

> Propheten waren oft Wunderthäter, d.i. im allgemeinen Verstande Beweiser der göttlichen Macht für seine [i.e. Gottes] Religion und Menschenvorsehung.

Nonetheless, even in these years, in an older manuscript for the „Erläuter= ungen zum Neuen Testament", his most orthodox work, he explains away the Pentecost miracle of the gift of tongues:[122]

> Keine neue Sprache war die Gabe: sondern die Freudigkeit, Richtigkeit, Bündigkeit, Einfalt, Herzrührung, mit der er [i.e. Peter] in der gewöhnlichen, gelernten Sprache sprach ---

In the „Theologische Briefe" in 1780, he says, however, that the Scriptural miracles cannot simply be explained away,[123] and in the „Vom Geist der ebräischen Poesie", two years later, he says of the Tower of Babel:[124]

> Ich nehme also die wunderbare Erklärung unsrer Sage an, weil ich keine natürliche weiß.

The word „Sage" and the admission that it is not the divine authority of the Scriptures but the lack of a convenient natural explanation which prompts him, clearly show the drift of his thought. In 1783, later in the same work, he says of Moses' miracles:[125]

> --- sie gehören --- auch nicht unabtrennlich zum Amt eines Propheten.

Referring to the divine legislation of Sinai, he goes on to say that <u>all</u> miracles have a natural explanation:[126]

> --- denn auch kein Wunder wirkt Gott ausser durch Naturmittel und Kräfte.

He says the same thing in another passage written around this time, but admits that none of the miracles of Israel have yet been completely explained in terms of natural agencies.[127] As for the „Ideen", Haym declares that the theory of the divine origin of language is the only instance of direct divine intervention invoked by Herder in this work.[128] However, we have already seen that some form of divine intervention in the natural evolution of the universe takes place with the creation of man. Yet only in one passage is there a hint, and it is only a hint, that such intervention is possible after the time of man's origin, and this is in the section of the „Ideen" devoted to "proving" that the soul is immortal:[129]

> Je mehr aber die menschlichen Kräfte selbst in Uebung waren: desto weniger bedorften sie theils dieser höhern Beihülfe, oder desto minder wurden sie ihrer fähig: obwohl auch in spätern Zeiten die größten Wirkungen auf der Erde durch unerklärliche Umstände entstanden sind oder mit ihnen begleitet gewesen.

The nearest approach elsewhere in the „Ideen" to ideas of this kind is in some of those teleological passages we have earlier noticed. Finally, it is no surprise to find that Herder dispenses completely with miracles in his later writings. On one occasion, he even secularises the word „himmlisch":[130)]

> Diesem Frommen [i.e. one of the saints of the Church] z.B. liessen sich Stimmen vom Himmel hören. Wer hörte diese Stimmen nicht in seinem Herzen? wenn sie gleich das Ohr nicht vernahm; sobald ihr Inhalt nur himmlisch, d.i. aufmunternd und erquickend ist.

And in 1794, he once more explains away the miracle of Pentecost as non-miraculous, claiming that the words usually translated as "new tongues" were really only „neue Auslegungsweisen der alten Propheten".[131)]

In the light of all this, we conclude from Herder's attitude to miracles, as also from his attitude to the divine inspiration of the Scriptures, that his theological beliefs on some of the most important doctrinal matters were profoundly influenced by naturalistic or even scientific principles rather than vice versa. The two doctrines we have discussed are particularly illuminating, because they neither of them readily lend themselves to the sort of reconciliation with scientific standards which was possible in some other cases with the help of the „Kraft" idea. Where he had to choose directly between the natural and the supernatural, Herder nearly always opted for the natural, even if denial of the supernatural meant deviating considerably from orthodoxy.

But before we leave the last topic, we may note that such eminent thinkers and scientists as Leibniz, Christian Wolff, Euler and Haller had accepted the authenticity of miracles,[132] and that even the materialistic psychologist Hartley indignantly exclaimed:[133]

> If anyone should affirm or think, as some Persons seem to do, that a Miracle is impossible, let him consider, that this is denying God's Omnipotence, and even maintaining, that Man is the supreme Agent in the Universe.

Zöckler shows that a fair number of thinkers did repudiate the miraculous in the eighteenth century, but adds:[134]

> Aber daß viele Celebritäten des naturwissenschaftlichen oder des mathematischen Fachs zu denselben gehört hätten, läßt sich nicht sagen.

All this is further evidence that Herder was not what Rouché calls him, a man striving to impose orthodox theology upon science, but that he was, in fact, less orthodox than many contemporary scientists.

We now come to another important feature of Herder's religion. One of the surest signs of rationalism or liberalism in theology is the tendency to emphasise the ethical value of religion rather than its transcendental aspects. This is what Lecky calls "that rationalistic spirit which regards doctrines simply as the vehicles of moral sentiments".[135] Bruford notices just such a tendency in Herder, saying:[136]

> An enthusiastic moralism was in fact the heart of his religion.

(We might add that he shares this with Lessing, whose religious ideas he greatly admired.) Bruford likewise points out that Herder never seriously believed in original sin, which is another sign of his marked heterodoxy, and describes his mature philosophy as "secular humanism".[137] We may

truthfully say that, in the Bible itself, the main attraction for Herder, apart from the aesthetic and emotional appeal of its poetry, the mystical power of passages such as the beginning of St. John's gospel, and the historical interest of the Old Testament as a commentary on Hebrew customs and society, is its ethical content, particularly in the New Testament. This moralism, which is reflected in the „Ideen" in the idea of „Humanität" and in the historical optimism which runs through the work, becomes increasingly conspicuous in his later years. In 1799, for example, he defines religion as follows:[138)]

> Religion ist innere Gewißenhaftigkeit.

In the previous year, he had written:[139)]

> Ginge der Name des Christs unter, so müßte dieser Glaube Religion der Menschheit heißen.

Yet in his most religious phase in Bückburg, he had written:[140)]

> Ist Moral die Hauptsache des Predigers und etwa Bibel und Rede Jesu nur Citatum --- lebe wohl, Christenthum, Religion, Offenbarung ---

But after he left Bückeburg, he himself increasingly treated ethics as the main object of religion.

We conclude that, while the influence of religion on Herder's scientific ideas has been much discussed by previous critics, not enough attention has been paid to the influence of those naturalistic ways of thinking which we associate with science upon his religious beliefs themselves. The latter influence was just as powerful as the opposite one, with the result that, in his mature period especially, Herder made great efforts to reconcile his religion with the naturalistic methods he had encountered in empirical philosophies and in science.

c) Natural religion: the natural and the transcendental.

The three central postulates of natural religion, those of God as the first cause, the immortality of the soul, and the freedom of man's will, have already been discussed in so far as they enter into Herder's scientific thought. We have seen that he uses them all at various times, but that even they are always introduced with some qualification. For example, he accepts the doctrine that God created the universe and man, yet combines it on the one hand with his conception of quasi-physical creative „Kräfte", thus coming at times very close to pantheism, as most critics have agreed, and on the other hand, with naturalistic theories about the evolution of the universe and of lower forms of life. Secondly, he combines the religious doctrine of immortality with his own vitalistic „Kräfte" and with heterodox, often Platonic theories of planetary habitation etc. And thirdly, he acknowledges the freedom of the will only in a qualified sense, as we noticed in our section on causality and teleology, and disposes of this time-honoured problem with a solution which in many ways resembles present-day ideas rather than traditional religious teachings. But since we have already studied the relationship of these postulates to Herder's scientific ideas, as well as the rôle of his „Kraft" conception as a bridge between the natural and the transcendental, we may now pass on to other topics.

Let us briefly review the development of Herder's attitude to natural religion in general. From an early stage in his life he tends to invest all scientific pursuits with the sanctions of natural religion. For example, in the „Journal", he calls Newton and other eminent scientists „Propheten der Natur, Ausleger der Gottheit".[141] This does not mean that he is forcing religion upon science; as Russell says:[142]

> Science itself does not become religious, even if the pursuit of the scientific way of life is endowed with religious significance.

However, as we noticed in our section on "ideal" evolution, Herder does seem to have accepted the doctrine of a transcendental God, as a first cause, even in 1769, that year of radical thought, although his views on immortality, that other pillar of natural religion, were rather ambivalent at the time. He thus tends, around this time, to introduce religious doctrines where science ends, or to lend the support of natural religion to avowedly naturalistic interpretations of the workings of the universe, and declares in his „Archäologie des Morgenlandes":[143]

> O es ist mit Eine der schwächsten Krankheiten des Menschlichen Geistes, eine übernatürliche Physik und Metaphysik der Schöpfung aus dem Verstande Gottes auch nur erwarten --- zu wollen.

He adds:[144]

> Religion wird in der Natur und die Natur in der Religion herrlich.

During the same period, he rejects traditional physico-theology, with its attempts to reconcile the findings of natural history and science with literal interpretations of individual Biblical texts,[145] and says that the Mosaic narrative of the creation is „offenbar nichts als Gedicht, Morgenländisches Gedicht".[146]

But as Haym notices,[147] he changes front in the „Älteste Urkunde" of 1774-76, and himself indulges in that physico-theology he had earlier condemned, and tries to correlate modern scientific theories, such as those of Haller, with the details of the first chapters of Genesis.[148] „Alles wirst du in Adam finden",[149] he says of the origin of man. However, in

the „Theologische Briefe" in 1781, he is more cautious about physico-theology, and says that, while the preacher may read the better works on science and on physico-theology, he should „nur die Kanzel verschonen --- mit Astronomischen Predigten".[150] He is now moving away from physico-theology towards his more characteristic standpoint, that of a broad natural religion. At this time, as later in his „Gott", he is uneasily aware of how close natural religion can become to pantheism or even atheism, and, in the work last quoted, he adds that we should beware of theories of (mechanical) necessity, of the deification of nature or „Natur=Atheismus".[151] We must accept a transcendental God as the first cause, and as a religious guarantee for the invisible creative „Kräfte" of the universe, otherwise we cannot escape that theory of machine-like necessity which Herder loathes; indeed, Hamann's comment on Robinet, quoted by Zöckler, applies to Herder too:[152]

> Quelque chose a été faite; donc quelque autre chose n'a pas été faite: donc celle-ci a fait l'autre. C'est à quoi on devrait réduire la théologie naturelle!

We have seen that, in the „Ideen", Herder applies Scriptural texts directly to science on a few occasions, especially when writing on the creation of man and the Biblical Flood, but it is usually only in connection with first causes and the immortality of the soul, those basic tenets of natural religion, and with the „Kraft" which lends these doctrines scientific "proof", that religious arguments involving transcendental factors appear. Otherwise, the words „Natur" and „Gottheit" are used interchangeably, and no specific theological doctrines encroach upon the scientific theories which Herder himself formulates or borrows from other writers of his age. This is the approach which he adopts in most of his later works, although he

becomes, of course, more outspokenly rationalistic towards theology as a whole in his later years. In the „Ideen", he is constantly at pains to preserve a balance between a personified nature and the transcendental God whom he invokes as the first cause, and his efforts are apparent even in his choice of words; but as Suphan realises, the balance inclines, especially in the spontaneously written first drafts of the work, towards the side of nature, which is invested with many of the divine attributes associated, in orthodox theology, with the transcendental:[153)]

> Als ein persönliches Wesen, als Mutter alles Lebens, als Schöpferin, Künstlerin, wird die Natur in den „Ideen" so häufig genannt und angeredet, daß der Verfasser sich in der Vorrede deswegen glaubt entschuldigen zu müssen --- Noch viel öfter aber hat er in der unbefangenen ersten Niederschrift die „schaffende Mutter" genannt, wo wir im Druck das Wort „der Schöpfer", „der Allmächtige" lesen.

And it is well known that, in his „Gott" of 1787, Herder, by means of his ubiquitous, invisible „Kräfte" (which partake of both natural and transcendental attributes), depicts God as so closely involved in the workings of nature that it becomes nearly impossible for the reader to distinguish clearly between the two. But after all, this ambiguity, as we have so often seen, necessarily arose out of his characteristic endeavours to attenuate the differences between opposites, until he could at last reconcile them.

We have already tested the claims of such critics as Rouché, who says of Herder that "les sciences telles qu'il les conçoit ne sont que la théologie appliquée à la nature",[154)] in the light of all his scientific

ideas, and we need say no more about his religious beliefs in direct relation to science. We have found that, throughout his mature years, he adhered to a broadly conceived natural religion, whose central tenets he attempted to "prove" from the workings of nature, which he usually invested with a religious significance. In the „Ideen", it is to nature, not the Scriptures, that he looks for manifestations of the divine, and he constantly strives to harmonise his religious convictions with the findings of science, and nature with the transcendental world, and usually succeeds, especially with his theory of metaphysical „Kräfte", in distorting both science and orthodox religion. For this reason, Sell rightly calls him a „Vermittlungstheolog",[155] and says that his greatest gift is „die Zusammenschau scheinbar und oft auch wirklich entgegengesetzter Dinge". This tendency, as we have seen, is characteristic of all departments of his thought - we need only recall his complex and eclectic geological theories, or his many conflicting interpretations of nervous reactions - and it was with this in mind that, in our first chapter, we rejected Clark's (originally Hettner's) contention[156] that Herder put forward relatively orthodox views at times, especially in Bückeburg, through conscious dissimulation with an eye to professional advancement and greater social security, but returned where possible to his "real" position of rationalism and unorthodoxy. There is no positive evidence whatsoever for this contention, and the continual contradictions throughout his thought can be explained without it, for they often occur in contexts, such as geology, neurology, and the theory of perception, where ulterior motives are quite inconceivable. Besides, arguments of this sort are dangerous, because they can be used to demonstrate anything at all; one recent Marxist critic argues on similar lines that Herder was really a

materialist, and that the revolutionary proletariat of today is the only true heir to his (and Goethe's) crypto-materialistic ideas.[157)]

d) Conclusion: the significance of natural religion.

Kant, in his first Critique, dealt a severe blow to natural religion, or the attempt to derive religious truths from the natural world, and subsequently reinstated its main postulates on a somewhat more critical basis than before. But, in rescuing these postulates by arguments based exclusively on moral considerations, he destroyed the older natural religion itself. In the impasse which natural religion reached in the later eighteenth century in Germany, men such as F.H. Jacobi, however, recommended another solution, that of basing religion entirely upon faith and ultimately upon the Scriptures, as Hamann had tended to do. Herder was never content with a religion of faith alone, however. He did not try to maintain orthodox views by keeping religion separate from science, as a religion based solely on faith would have required, but tried to preserve the main tenets of natural religion, especially those of God as the first cause and of the soul's immortality (both of which, incidentally, were recognised even in Robespierre's 1795 constitution in revolutionary France[158)]), by "proving" them from the workings of nature. Concentrating on natural religion in his mature years, he moved further and further away from orthodoxy, and the Leibnizian doctrine of metaphysical „Kräfte", which he used in support of natural religion, brought him close to pantheism, which eventually became the new natural religion of many Romantics. In the course of its development, natural religion in Europe was progressively watered down, from the deism of Descartes, and the English school of deists in the first half of the eighteenth century onwards, passing directly into materialism in France,

and, with Spinoza in Holland, Shaftesbury in England, and the emotional pseudo-Spinozists of Weimar and of German Romanticism, into pantheism in several other quarters. In fact, as Carl Becker has shown in his outstanding work on eighteenth century rationalism,[158a] the natural religion of that era inexorably led on towards atheism, although even the most radical among the "philosophes" retained many secularised Christian values (especially in their ethical views and in their faith in nature's order and benevolence). The natural religion of the rationalists represented an unstable synthesis, which proved untenable in the long run, and called either for a return to revealed religion, or for the admission that neither transcendental nor ethical postulates can be proved from the workings of nature. Becker says of the reason in which the eighteenth century had so much faith:[158b]

> She is pointing in two directions: back toward Christian faith; forward toward atheism.

In the highly illuminating case of Reimarus, natural religion made revealed religion superfluous - the respected Hamburg theologian finally alleged that much of the story of Christ was deliberately forged by the apostles.

In the 1780's, Herder, no doubt encouraged by Goethe, became more and more preoccupied with nature as the basis of religion. Rouché says of the „Ideen":[159]

> La place importante accordée dans cette philosophie d'histoire aux sciences proprement dites, et aux sciences non historiques, en général, révèle tout simplement le caractère théologique de cette entreprise.

To this it may be objected that, as with the development of natural religion

as a whole in the eighteenth century, it shows a weakening of traditional theology, which can go so far that nature threatens to engulf the transcendental entirely. However, Herder must not be seen as a complete pantheist any more than as an orthodox theologian. E.C. Mason rightly says of him „daß er zwar zu sehr Pantheist ist, um orthodoxer Christ zu sein --- andererseits noch immer zu sehr traditioneller Christ, um ein restloser Pantheist zu sein."[160] He stood precariously at the end of a development by which natural religion was transformed, in Germany, into nature pantheism, and, uneasily aware of the inconsistencies of his position, which Kant attacked in his review of the „Ideen", Part I, and Goethe, Knebel, and probably Einsiedel, criticised verbally or in letters, he tried to graft the principal postulates of natural religion on to scientific arguments, in a final attempt to demonstrate their truth from the workings of nature. His early pietistic background, his profession and Hamann's influence all encouraged him to retain certain features of orthodoxy and theism; traditional natural religion, in parts of the „Ideen", drew him towards deism; and the logical difficulties inherent in natural religion, together with his desire to reconcile the natural and the transcendental in a "monistic" synthesis, brought him uncomfortably close to pantheism, and even, as in 1769, to materialism. In the long run, his complex and contradictory system, if we can call it a system, broke down; the turning-point was reached when he repudiated teleology in 1787. In his later years, his natural religion tended to give way to a secular moralism and, as we shall shortly see, to a form of cosmic mysticism. When he returned to the study of revealed religion in his „Christliche Schriften" of the 1790's, the effects of his preoccupation with nature became obvious. We have seen in our discussion of miracles and the inspiration of the Scriptures how, like Reimarus, he

could no longer find room for the supernatural, and tried to explain it away or secularise it.

The conclusions reached in this section can be summarised as follows. Herder sometimes imposed theological methods upon science, and at other times, he imposed naturalistic or scientific methods upon theology, and both science and theology suffered in their traditional or accepted forms. Most of his scientific theories, except those involving the conception of „Kraft", which is of metaphysical rather than of theological origin, and those which are indirectly affected by his "proofs" of the immortality of the soul and of God's agency as a first cause (the two most important tenets of natural religion), are uninfluenced by theological considerations. On the other hand, only the proposition that man, with his earliest specifically human endowments, was created by God (a doctrine generally accepted in Herder's age), the above-mentioned tenets of natural religion, the moralism which is typical of rational theology, and little else, survive the criticism of naturalistic methods in his mature period, and even some of these are further qualified in the more radical writings of his later years. On the whole, his theology, in an age when, as Zöckler points out,[161] most scientists were „entweder bestimmt christlich, oder wenigstens entschieden theistisch gerichtet", is by no means orthodox, but rather what we should call liberal. We repeat that, in his mature period, it was his own aim to reconcile science and religion, nature and the transcendental, without subordinating either, just as he wished to show that all forms of knowledge and truth are interrelated, but the difficulties with which natural religion is fraught made his syntheses precarious, sometimes little more than verbal,

with "God" and "nature" used interchangeably, until, spurred on by the criticisms of others, by his studies of Spinoza and by his continued preoccupation with the natural world and its causal laws, he gradually allowed nature, infused with divine attributes, to gain the ascendancy over the transcendental, so that, in his later years, little more than secular moralism and cosmic nature-mysticism remained.

4. Science and mysticism.

Clark writes:[162)]

> Neither in Bückeburg nor in Weimar was Herder a mystic.

It would certainly be inaccurate to call Herder a mystic, just as it would to call him a scientist or an artist, but there was something of all these in him, and a great deal more besides, so that in calling him any one of them, without qualifying our statement or referring to his other interests, we should be doing him an injustice.

However, we have already met numerous mystical conceptions in his writings on science, and it will be well to examine the question of mysticism in more detail here, and to try to define its relationship to his scientific thought.

Few critics have given much attention to the mystical aspects of Herder's writings. This is probably because Herder himself speaks of religious mysticism in an uncomplimentary manner. For example, in Part IV of the „Ideen", he says of medieval mysticism:[163)]

> Glücklich, daß die Zeiten beinahe vorbei sind, in welchen dies Opium Arznei war und leider seyn mußte.

But as Rouché says:[164)]

> Ce qu'il réprouve sous le nom de mysticisme, c'est une religiosité purement spéculative qui dédaigne l'action.

In fact, he is not a religious mystic in this sense at all, and thus finds much to criticise in mystics who labour to lose themselves, by contemplation, in the transcendental. His religion is too bound up with this world to leave him much scope for passive contemplation of the absolute. Nonetheless, some of his Bückeburg writings on religion do exhibit religious mysticism, as when he goes into raptures over the divine logos and light, along with the more usual nature mysticism which we have noticed in connection with his scientific ideas. But neither in religious nor in nature mysticism does he seek oblivion through contemplating the permanent or the static in themselves. Even in his religious works, his mystical emotions are directed towards the dynamic, and he believes that the divine logos manifests itself in „Wirkung" or „Werden", just as he sees nature itself as dynamic. For nature is really the source of most of his mystical emotions, even when he relates these to Christian doctrines. Accordingly, it is his nature mysticism which we shall examine in this section.

Herder venerates the permanent only in the regularities which arise in change itself, and looks, like Goethe, for „Dauer im Wechsel", not for „Dauer statt Wechsel"; the permanent takes its meaning only from change, and the two are always inseparable, as they are in the workings of nature. For example, like Goethe in the „Prolog im Himmel" in „Faust", he writes of God in his „Maran Atha" of 1779:[165)]

> Alles lebt unter ihm und eilet zum Leben --- Und Gott der Schöpfer ruht auf ihrem rastlosen, vermischten Gesange.

The permanence of God is akin to the changeless order behind all natural

change.

Thus it is not so much to his theological writings that we should look for his mystical ideas, especially those of his mature and later years. Those who deny that he has any mystical leanings presumably denote by the word "mysticism" an unusually contemplative form of devotion within the Christian tradition, and naturally enough, they find relatively little of it in Herder's thought.

Bertrand Russell points out that the first principle of mysticism in general is "that all division and separateness is unreal, and that the universe is a single indivisible unity."[166] The word "universe" here at once supplies a link with Herder's mysticism, which is not usually focussed upon the transcendental, but upon the ultimate unity of the visible universe, the universe he sought to comprehend through his studies of science. Furthermore, one of the consequences of the above proposition, as Russell points out, is religious unorthodoxy:[167]

> For Christians, there is the --- difficulty of avoiding pantheism: if the world was <u>only</u> apparent, God created nothing, and the reality corresponding to the world is part of God; but if the world is in any degree real, and distinct from God, we abandon the wholeness of everything, which is an essential doctrine of mysticism, and we are compelled to suppose that, in so far as the world is real, the evil which it contains is also real. Such difficulties make mysticism very difficult for an orthodox Christian.

In short, mysticism cannot readily separate nature and the transcendental. Anyone who has read Herder's „Gott" will at once recall how he grapples with these very difficulties, trying to uphold his pseudo-Spinozistic monism (and

monism, in its pre-materialistic forms, is always close to mysticism) without denying the transcendental God of Christianity. Koch, whose short study of Herder's mysticism is the best contribution in this field so far, takes notice of these disturbing consequences of his (ultimately mystical) monism, and refers in particular to his "dialectical" scheme of the universe, set forth in the important essay of 1777, „Über die dem Menschen angeborne Lüge":[168]

> [Diese ist] eine Auffassung, die alles andere als orthodox genannt werden muß und, wenn sie die Kontrareität des Menschen in der ganzen Schöpfung vorbereitet sieht und Gut wie Böse in die Einheit des göttlichen Wesens verlegt, viel eher an Jakob Böhme, an das Luziferische im Menschen - daher auch die Vorliebe für das Prometheus=Symbol - anzuknüpfen scheint als an das Dogma.

Indeed, we need not wonder that so many heresies have originated in mysticism.

But to return to our earlier point, the universe as a whole is the object of Herder's mysticism. From our study of his scientific ideas, it should now be evident that he considered the universe as made up of „Kräfte" and of the visible forms or configurations which they produce through their interaction. As Herder sees it, we can therefore describe the universe as a whole only if we take into consideration its form as well as its content. Thus, he envisaged the Chain of Being both as a series of „Kräfte" or soul-like entities and as a series of forms or „Organe", for „Seele" and „Organ", he always insists, are inseparable. False mysticism or „Schwärmerei" results from an obsession with „Geistigkeit" or content, whereas „Abgötterei" results from an exclusive preoccupation with „Körper" or outward form, as Herder, quoting a remark of Lavater's to this effect,[169] agrees.

In the pre-Weimar years, however, especially in the 1770's, he was himself much more preoccupied with dynamic „Kräfte" than with the orderly

forms which are produced by them. The most mystical of his theological writings, the „Älteste Urkunde", is infused with a strange theology of „Kraft", for he considered that „Naturkräfte" were the object of the "purer" devotion of the earliest worshippers, and, at other times, he associates such „Kräfte" with the logos of St. John and with the divine light. As Kühnemann observes:[170)]

> Auf einem mystischen Abgrund vollends ruht unser Wissen, wenn von dem Universum der göttlichen Kräfte die Rede ist, das als immer dieselbe Gotteskraft in allen Erscheinungen lebt.

„Kraft" is the object of a thoroughly emotive mysticism, and is in this sense equivalent to creative power or spirit, just as form, which is more amenable to rational treatment, is the object of a more intellectual mysticism. Herder's mysticism of „Kraft" reminds us of Giordano Bruno, with his "cosmical piety, finding its object in the creative energy manifested in the universe."[171)] His enthusiasm, in the Bückeburg years, for the „Gärung" of the Dark Ages, his poetic raptures over the „Gottesfülle der Natur",[172)] his assurance that life itself persists even when individuals, who may see only chaos and transience, are destroyed or assimilated by "higher" beings, his delight over the teeming plenitude of the ever-changing universe - in short, all that is Lucretian, Dionysian or daemonic in his thought is related to this emotive mysticism, which venerates in all things the universal „Kraft". The same kind of mysticism colours the „Naturhymnus" of Shaftesbury which Herder translated, and it reappears in Tobler's „Naturfragment" and in many passages of the „Ideen". In the essay „Über die dem Menschen angeborne Lüge", the following statement is of the same kind:[173)]

> Alles Leben entspringt auf solche Weise aus Tod, aus dem Tode niedrigerer Leben, alle Organisation aus Zerstörung und

> Verwandlung geringerer Kräfte, alles Ganze der Ordnung und des Plans aus Licht und Schatten ---

But already in the "hieroglyph" of the „Älteste Urkunde", Herder employs a symbol which mediates between his „Kräfte" and the form which their interaction creates. And Pamp rightly says, referring in particular to the „Ideen":[174]

> Oftmals finden wir in seinem Werke Symbole der mathematischen Mystik: den Kreis, die Kugel.

In fact, from the time of the „Ideen" onwards, he often uses mathematical (formal) symbols to describe the mystical unity behind the main processes of the universe - the circle with radii converging upon the centre,[175] the Golden Mean, or balance between opposites, the sphere, that ancient symbol of unity and self-sufficiency,[176] and some others which we noticed in our section on mathematics. We earlier pointed out that the dialectical triad is also an ancient formal device for expressing the mystical union of opposites. From the time of Pythagoras mathematical formulae have always tended to appear in more abstract mystical writing. For they are, by definition, universal, formal generalisations, and the more "intellectual" as distinct from intuitive or emotional mystics have often found them convenient for expressing the widest generalisation of all, the mystical vision of the entire universe as One. Whitehead's definition of the first step in mathematics would also apply to the first step in what we have called "intellectual" mysticism:[177]

> --- when we have put aside our immediate sensations, the most serviceable part - from its clearness, definiteness, and universality - of what is left is composed of our general ideas of the abstract formal properties of things.

And as Kepler's greatest biographer writes:[178)]

> --- mysticism, indeed, in the lucid brightness of its contemplation, comes closer to the transparency of mathematical observations than is known or suspected by the many representatives of a meagre and obscure interpretation of that intellectual domain. What comes first is not emotion seeking expression, but the clear thoughts, which rouse fire and emotion.

This kind of mysticism always uses rational, formal symbols to describe the unity of the universe; only extreme religious mystics, whom Herder would have called „Schwärmer", attempt to dispense entirely with symbols of some sort.

At this point, we may recall another of Herder's favourite mystical symbols, one which he used on his signet, and which later adorned his tombstone - that of the snake biting its tail, the ancient symbol of infinity or eternity. Like the mathematical symbols, it is related to the natural universe and thence to science, and it appears in Bode's „Anleitung zur Kenntnis des gestirnten Himmels" of 1768, a work from which Herder borrowed many ideas on astronomy. Bode writes of a vignette of the stars which appears in his book:[179)]

> Diese Figur wird durch das alte Sinnbild der Ewigkeit, nemlich einer Schlange, welche das Ende ihres Leibes im Munde hält, begrenzt, um den für uns unendlichen Umfang des Weltgebäudes anzudeuten.

In our chapters on Herder's scientific ideas, we have already seen how his sense of form develops more fully in his mature and later years, and this, of course, also affects his mystical conceptions. During these periods, he strives more and more to find a balance between form and content, between the principles of order and his creative „Kräfte", and also, as we

have seen, between the individual and society, unity and variety, etc. He expresses the harmony of unity and variety in the „Ideen" by the old mystical idea of a central body upon which all creation converges:[180)]

> Also ringet wahrscheinlich auch hier die größeste Mannich= faltigkeit zur Einheit und die allumfassende Natur wird ein Ziel haben, wo sie die edelste Bestrebungen so vielartiger Geschöpfe vereinige ---

He is most successful in his attempts to harmonise form and content on a mystical level in his late poems, and in some of those curious visionary pronouncements which he makes in his later years, for example in the piece entitled „Kalligenia", already discussed in connection with his mysticism of light (a symbol by which he expressed the unity of „Kraft" and visible form). Manifold, ever-changing „Kräfte" and ultimate balance or harmony are the two sides of his later mystical perceptions, and it is always the natural universe, often the universe of astronomy and mathematics, which provides their framework. In 1802, he writes in the style of a visionary that „der prüfende Blick des Weltalls" has appeared to him. (We are at once reminded of his Masonic affiliation.) He continues:[181)]

> Durchgedrungen vom Gefühl des großen Gleichgewichts, das in der Natur alles hält und trägt, das das Bewegte zur Ruhe bringt und das Ruhende beweget, erwachte ich zum zweitenmal und freuete mich einer Welt, die, auf so veste Gesetze gegründet, Allem Maas und Ziel giebt und zu der auch ich gehörte.

In 1785, he had given voice to similar mystical feelings, on this occasion, however, using the language of astronomy (and music, that perennial expression of universal harmony):[182)]

> Mein Gang ist die Bahn des Weltalls: dazu leuchtet mir jener letzte Stern, dazu klingt mir, in geistigen Begriffen und Verhältnißen, die Harmonie aller Sterne.

Like Kepler, Herder believes that the astronomer, rather than the artist, is the greatest seer. For we have seen that in the „Kalligenia" sketch, it is the astronomers, not the artists (whom he leaves behind him), who reveal to him the mystical unity behind the dynamic cosmos. He concludes:[183)]

> Ich genoß und empfand hohe und höchste Einheit, die Uebereinstimmung und rastlose Wirksamkeit der Natur, ewige Palingenesie, immer junges Leben. Ich sah, daß nichts sich übereilen könne, daß Alles sich folgen müße und ewig folge. Maas, Zahl, Gewicht, Bewegung schwanden mit den Sinnen dahin; Eines lösete sich in das Andre auf.

Science therefore ultimately ends in mysticism for Herder. Both science and mysticism are occupied with the „Kräfte" and regularities of the universe, but mysticism is the level upon which the widest conclusions of scientific thinking are further generalised, almost to the point where they become meaningless. The symbols which Herder uses to express the unity of the universe, like light, equilibrium, harmony, the circle, the sphere, etc., are usually closely associated with science. His characteristic aim of synthesising all his extensive knowledge finds expression first of all in his "monistic" philosophy, and often, on a more general level, in mysticism. For the ultimate generalisations of his thought are not exact and particular enough to be scientific, and they are too abstract to lend themselves readily to poetic treatment. He was not so able as Goethe was to discover the universal in the particular, although he does usually think of everything holistically. (Holism itself, as Popper remarks,[184)] is related to mysticism.) Instead, he felt that he must comprehend the universe directly as a whole, and his resulting perceptions could be expressed only in the language of mysticism. Natural religion tends to merge into mysticism or even pantheism, as we noticed in our last section, and Herder's scientific

thought is much more influenced by mysticism than by orthodox Christianity. We have already discovered, while analysing his scientific ideas, that they frequently broaden out into mystical perspectives; this was so of his idea of „Kraft", his holistic principles, his dialectical formula, his mathematical symbolism, his conception of "ether" or the universal medium, his interest in astronomy and the analogy of gravitation, his ideas on light, his theories of "ideal" evolution, „Palingenesie", planetary habitation and the universal Chain of Being, his Platonic conception of the body as the expression of the soul, and all the other notions he culled from the Platonic and neo-Platonic traditions. All his aspirations towards synthesis and reconciliation were bound to end on this dimension, and science, the study of the changes and regularities in nature, provided him with much of his mystical inspiration and symbolism. But, being so general, mysticism usually began where science stopped, and did not interfere on most occasions with particular scientific theories and observations. Herder was too interested in all the detail and profusion of knowledge and experience ever to become a complete mystic; his mystical leanings became most pronounced in his later years, when he became disillusioned in much of what he saw around him. But at all times, he expressed in terms of mysticism his deep-seated conviction that the universe, like knowledge itself, is fundamentally One.

5. Science and art: nature and aesthetic values.

Siegel, in his history of German „Naturphilosophie", refers to the aims of Herder, Goethe, and other contemporaries as follows:[185)]

> --- wie die Wissenschaft mit der Religion versöhnt werden soll, so wollen auch Wissenschaft und Kunst sich jetzt vermählen und

ihre Grenzen ineinanderlaufen lassen.

Goethe, above all, is known for his achievements in this direction, but we shall now try to show that Herder, in his own way, was equally intent upon reconciling art and science, in accordance with his belief that all mental activities are fundamentally related.

a) The influence of art and aesthetic values upon science.

Reviewing a work by the aesthetician Sulzer in 1774, Herder approves of the aim „Wahrheit und Schöne, Schöne und Tugend zu gatten, und Alles als Eins, als verschiedenes Phänomen Eines Wesens zu betrachten".[186] And in 1782, he says, like Shaftesbury:[187]

--- Schönheit ist nur die äußere Gestalt der Wahrheit.

Since, therefore, he associated truth so closely with beauty, we should expect to find some traces of aesthetic values in his scientific ideas. Such traces are, of course, in evidence, although he insists that science must never allow the desire for beauty to interfere with exact observations:[188]

Eine verschönernde Zoologie arbeitet ihrem Zweck entgegen:
eine verschönernde Anthropologie nicht minder.

For the links between scientific and aesthetic methods, between art and nature, are given, for Herder, in the very nature of reality, in that intimate relationship between truth and beauty which we mentioned above, so that there is no need for the scientist to distort his observations in order to find beauty in nature.

It is one of Herder's axioms that all great scientific achievements share something with artistic creativity. Kant's theory of the universe, and Whiston's theory of the earth, he says in 1766, both have the quality of

„Einbildungskraft".[189] He also says on several occasions that great philosophical systems, such as those of Berkeley, Spinoza, Leibniz and Descartes, likewise have an imaginative quality, and calls them „Fiktion" or „Dichtung", without necessarily wishing to belittle them.[190] In 1774, he commends the style of Haller, even that of his physiological works, as „dichterisch",[191] and, around the same time, he speaks of „Buffons Roman der Thiererzeugung",[192] thereby echoing a remark of Hamann, who had written:[193]

> Wer Mose und den Propheten nicht glaubt, wird daher immer ein Dichter wider sein Wissen und Wollen, wie Buffon über die Geschichte der Schöpfung ---

Hamann had used the word „Dichter" pejoratively, just as Herder uses the word „Roman"; but, on most occasions, Herder mentions the imaginative and creative qualities of science (and philosophy) only with praise. For example, he writes in 1776 of Copernicus:[194]

> Zeichnungsgefühl nemlich [sic], sein Sinn für Symmetrie und Verhältniß zum Ganzen war der Finger Gottes, der ihm das Weltall wies.

He generalises this principle as follows:[195]

> Zu den größten Entdeckungen, die wir dafür halten, wirkte Einbildung, Malerei, Poesie herauf und hielt die Leiter!

He repeats this conclusion in 1800, referring to Newton's physical system in particular:[196]

> Wer in Wissenschaften erfindet, bringt eben sowohl etwas Eigenthümliches, Neues aus sich hervor, das er nicht lernte (sonst hätte ers nicht erfunden), als der Dichter.

Such utterances are surprising, not only because they come from Herder, who

tends to emphasise inductive methods in science (at least in his theoretical pronouncements), but also because they strike us as modern. Only relatively recently has the part played by imagination in formulating scientific hypotheses and theories been properly appreciated. But in a passage shortly after the previous one, in 1800, Herder again stresses the external, stylistic qualities of great scientific writing, just as he had praised Haller's style as „dichterisch" in 1774. He writes:[197)]

> Euklids Elemente, Newtons Principien, la Place Werke sind ihrer Art nach im größten Geschmack, Kästners mathematische Schriften mit eben dem treffenden Geist, wie seine Vorlesungen und Epigramme geschrieben. Kein Ungeschmack im Vortrage sollte erlaubt werden.

The scientific virtues of „Genauigkeit, Ordnung, Klarheit" are the same as those of good taste, he later maintains.[198)] And again, bringing us back to his axiom that truth and beauty, science and imagination are inextricably linked, he declares:[199)]

> Die stärkste, reinste Aussprache der Wahrheit, wird ihrer Natur nach allenthalben Dichtkunst; jedes System ist selbst ein Poëm, so fern es mit sich bestehend, ganz und rein ist.

Thus he believes (in our opinion with justice and originality) that great scientific achievements are not lacking in something akin to artistic imagination and creativity, that certain aesthetic criteria, such as a sense for symmetry and proportion, may aid the scientific theorist (e.g. Copernicus), and that the finest qualities in great scientific writing, notably its order and clarity, are the same as the virtues of good taste and style in other fields.

In Herder's opinion, some of the aesthetic qualities we may discern in science are derived from the nature of perception itself. In his unusual essay „Über Bild, Dichtung und Fabel" (1787), he notices how subjective elements supervene when, in the very act of perceiving, we unconsciously construct ordered „Bilder" out of what we see, and when we unwittingly project ourselves into the things we see, and thus personify non-human, natural agencies. He observes that primitive peoples especially are inclined to personify nature, and adds:[200)]

> --- indessen bleibt auch bei uns jede Physik eine Art Poetik für unsre Sinne, aus unsern Erfahrungen geordnet; und sobald unser Geist in andern Organen die Natur sähe, würde er nothwendig anders classificiren.

It is indeed true that older science especially is full of personifications; as we have seen, even a "force", if treated as real in itself, is a personification. Goethe too notices this connection between poetry and early science, saying:[201)]

> --- nirgends wollte man zugeben, daß Wissenschaft und Poesie vereinbar seien. Man vergaß, daß Wissenschaft sich aus Poesie entwickelt habe ---

Herder further notices that science, like primitive mythology, itself tends to divide nature into two principles or even sexes[202)] - he is doubtless thinking of those "dialectical" theories of magnetism current in his day, and of concepts such as „Wahlverwandtschaften" in chemistry. But although, as we have said, he realised that such ideas are produced by the subjective imagination, he does not condemn them as unscientific, and, as we have repeatedly noticed, himself personifies „Kräfte" etc. on many occasions. In such cases, therefore, he allowed his conviction that imagination can

lend support to science to do violence to the empirical principles he had learnt from Bacon, the early Kant, and others. He is perfectly correct in his remarks on personification so far as the older science is concerned, but he does not seem to realise that science has to free itself from personifications wherever possible, that it had already largely succeeded in doing so, and that the more obvious personifications surviving in his day were already obsolescent.

We have seen so far that Herder believed that the scientist shares certain values in common with the artist. We shall now try to show how he also thought that the object of science, i.e. nature and its laws, displays aesthetic qualities.

Pamp rightly observes that, like Bonnet (and Shaftesbury, we should add), Herder sees something aesthetic in the order of nature.[203] In fact, that universal harmony we discussed along with his mystical ideas is the object of his aesthetic as well as his mystical admiration. The „Kalligenia" sketch, already mentioned several times, ends with a vision of „Kalligenia, die Mutter der Schönheit", whom the writer has sought and found in the workings of the universe:[204]

> „Ich bin, die du suchest", sprach sie mütterlich=freundlich, „Kalligenia, die Mutter der Schönheit: mein Kind ist die Natur. ---" Mein Traum entfloh; aber ihr Bild - allenthalben suche ich es auf in Gesinnungen, Thaten und Gestalten; sein kleinster Abglanz entzückt mich, mich erinnernd an Sie.

Herder here uses the ancient symbol of the mother-goddess with her child to express not only the mystical unity and harmony of the universe, but also the ideal of beauty, which, he believes, is fulfilled in nature itself rather than in art; for we should remember that, in his dream, he leaves

the artists behind, and finds greater enlightenment with the astronomers. (His disillusion in Goethe and Schiller during his last years is no doubt partly responsible for this.) He believes that nature itself provides the primary models of beauty, and it is always to nature that the artist should turn for inspiration.

But in what exactly does the beauty of the universe consist? Max Caspar's words on Kepler, whom Herder greatly admired, could just as well apply to the older Herder himself:[205]

> "Forma mundi", the shape of the world, formed the great theme of his life's work. In it the idea, form, does not have the pale meaning of today's usage. It concerns the principle of order and configuration, that which makes the chaotic material into a cosmos, and also the epitome of the idea of the lovely, made real in the world.

To express this universal form or order, Herder, as we saw in the previous section, uses certain general expressions borrowed from mathematics or science, and invests them with a mystical significance. We can now appreciate that such expressions may also have an aesthetic content. Indeed, what we called "intellectual" mysticism, the mysticism of rational forms, usually has a strong aesthetic bias; this should be obvious when Herder uses musical expressions such as „Harmonie" or „Wohlklang" to describe the universe, and in Kepler's (originally Pythagorean[206]) theory, which Herder mentions,[207] that the hypothetical ratios of distance between the orbits of the various planets must correspond to intervals in the harmonic series. As we earlier remarked, Herder uses scientific expressions, like Lambert's „Maximum", as formulae for beauty,[208] in this case as a dynamic equivalent for the traditional (static) Golden Mean, which, however, he also applies to

nature on many occasions.[209] The idea of unity and variety, which he often uses in describing the universe, is another aesthetic criterion. And as Siegel remarks:[210]

> Es werden ferner insbesondere die Linien [i.e. "lines of beauty"] und die Lagen, die sich unter gewöhnlichen Voraus= setzungen als Ergebnis der einwirkenden Kräfte darstellen, uns am angenehmsten berühren und als schön bezeichnet werden, so z.B. die Kettenlinie als Verbindung zweier Punkte --- oder wieder die symmetrische Anordnung entsprechend dem mechanischen Gleichgewichte.

However, the objections we raised against Herder's theory that science, like art, must personify natural agencies, also apply to his theory that the universe must conform to aesthetic principles. Our standards of scientific accuracy need not be impaired if we happen to add to our empirical findings the observation that certain natural regularities are aesthetically pleasing; but it is a different matter when we apply aesthetic tests to scientific hypotheses, and say that the more "aesthetic" hypothesis is likelier to be the correct one. The Platonic and Aristotelian principle that the motions of the heavenly bodies, which are more "perfect" than the earth, must be more regular than earthly motions,[211] was a hindrance to astronomy for centuries.[212] Bacon, as we noticed earlier in this work, rightly impugned this a priori scheme, condemning it as an example of the "idola" which he listed as impediments to knowledge. Another ancient preconception, the idea that the universe in its entirety must be a sphere, the "perfect" shape and the epitome of self-sufficiency,[213] survives in Herder's theory, already mentioned in our section on dialectics, that the magnet is like a sphere, and his predilection for the image of the „Kugel" when extolling the

perfections of the universe.[214] As Galileo, that peerless champion of common sense, once exclaimed:[215]

> For my own part, never having read the pedigrees and patents of nobility of shapes, I do not know which of them are more and which are less noble, nor do I know their rank in perfection.

But not only in the question of forms and shapes was Herder fond of introducing aesthetic values into science. He writes in 1778:[216]

> Ich --- glaube übrigens, daß Homer und Sophocles, Dante, Shakespear und Klopstock der Psychologie und Menschenkänntniß mehr Stoff geliefert haben, als selbst die Aristoteles und Leibnitze aller Völker und Zeiten.

Shortly afterwards, he includes in his list of data which are useful to the psychologist not only „Bemerkungen der Aerzte und Freunde" (of the pathological patient), but also „Weissagungen der Dichter".[217] And in his famous essay on Ossian, he had considered elaborating a „Psychologie aus den Gedichten Oßians".[217a] We must remember that he believed that psychology can and ought to become a science, which means that he has here allowed his interest in art to modify his more strictly scientific ideals. There can be no doubt that, by present-day standards, he overrated the value of works of art for psychology - they usually tell us more about the artist himself than about psychological types in general - and that he underrated the value of exact and extensive statistical observation, to which he was by nature disinclined. As Götz remarks:[217b]

> --- die Dichter werden von Herder in ihrer Bedeutung für die Psychologie überschätzt.

However, by eighteenth century standards, he had some justification for some

of these observations, because, as we earlier noticed, the poets and novelists of the day were often far ahead of the professed psychologists in psychological insight. Even in 1857, Buckle (who resembles Herder in many ways) could write:[217c)]

> The most accurate investigators of the human mind have hitherto been the poets, particularly Homer and Shakespeare.

But besides all this we have repeatedly noticed, in our study of his scientific ideas, that they are often influenced by aesthetic judgements. This happens when he tries to classify racial and animal types: in this case, aesthetic standards (Camper's craniological angle, we may recall, was originally an aesthetic measurement) conflict with morphological ones. Even the traditional conception of a universal Chain of Being, with man in the centre and two symmetrical series of beings above and below him, is full of aesthetic significance. Herder's[218)] (and Burnet's[219)] and Kant's) theory that the axis of the earth must originally have occupied a position at 90° to the plane of the ecliptic, and his idea that the earth's magnetic and rotational poles must once have coincided, are just as much aesthetic as scientific in origin. And the attempts of both Herder and Schelling to reconcile the theories of Newton and Euler on light and colour also began, as Haym observes, „aus Gründen des ästhetischen Gefühls".[220)]

But even the plan and style of Herder's greatest work, the „Ideen", is influenced by aesthetic as much as by logical and objective standards. As Gillies says:[221)]

> The thought-progression is --- that of poetry not of logic --- The thought <u>is</u> coherent, and <u>is</u> understandable. The unity is an artistic one.

Kühnemann (who, however, tends to exaggerate his point), is of a similar

opinion. He writes:[222)]

> Es ist ein ästhetisches Gefühl, in dem Herder alle Teile seiner Welt empfindet, ästhetisch wirken sie auf ihn. Oder vielmehr, in der ästhetischen Wirkung auf ihn vollendet sich das Leben, das er ihnen gab.

We have now seen enough of Herder's theory and practice, so far as the influence of art and aesthetic values upon science is concerned, to sum up our conclusions and pass on to other themes. He was unusually alive to the genuine contribution which creative imagination can make to scientific thinking as well as to art, and to the influence of aesthetic feeling upon science. He not only pointed this out in theory, but also put his ideas into practice, sometimes passing general aesthetic judgements upon the regularities of nature, but at other times allowing his aesthetic sense to influence his scientific theories to their detriment. His style, in the „Ideen" and other works dealing with science and nature, is often affected by artistic emotion more than by dispassionate logic, but stylistic idiosyncrasies alone neither add to nor detract from the validity of scientific conclusions, and we should not refuse to take his scientific ideas seriously simply on account of his style. But what we earlier saw of the effects of aesthetic preferences upon his particular scientific theories should help to corroborate the following proposition of Russell:[223)]

> Preconceptions that have an aesthetic origin are just as misleading as those that are moral or theological ---

Too many critics have analysed Herder's theological preconceptions, but too few have given attention to his aesthetic standards and their influence, which is at times harmful, upon his scientific ideas.

b) The influence of science upon art.

> Man macht beständig Unterschied zwischen Naturkunde und Aesthetik; und im Grunde muß Aesthetik eine Naturlehre und zwar die simpelste Naturlehre des Schönen seyn. 224)

Thus Herder writes in 1769. In the fourth „Kritisches Wäldchen" of the same year, he says that the objective aesthetics of the future will be based upon physics,[225] and, as we have seen, he himself went some way towards fulfilling this aim by applying optics and acoustics to the aesthetics of sense-experience. Thus, in a measure unusual for his day, he attempted to apply science directly to aesthetics.

But he believed that science should influence art in a further way. Like a few others among the poets and critics of his age, he was aware that the mythological conventions passed down in poetry from classical antiquity were rapidly becoming threadbare and devoid of their original significance. The great message he delivered to Goethe in Straßburg was that such empty and artificial conventions must be abandoned, and that the new art must take its inspirations directly from nature. The results of his exhortations are too well-known to need mention here, and they were indeed momentous. Nonetheless, poets and critics continued to feel the lack of a new symbolism to replace the antique devices, and the Romantics continued to search, as Haym observes,[226] for a "new mythology".

Klotz had suggested that „Entdeckungen der Naturlehre" might replace mythology in poetry.[227] Herder approves of imagery borrowed from science (usually from natural history) in poetry, and he recommends the works of Haller, Withof and Dyer as examples. But unlike Klotz, he does not wish to replace mythology entirely by scientific facts and images. He claims with

reason that such works as Grainger's didactic poem on sugar-cane are often over-technical and tedious.[228] New data provide new images, but poets should learn how to use these by studying the older mythological poetry:[229]

> Gleichnisse also machen hier keinen Gegensatz, nicht die Mythologie unnöthig, nicht die Naturlehre zur Mythologie --- Aus der Mythologie eben lerne man, die Naturkunde dichterisch zu bilden, nicht aber aus der Naturkunde die Mythologie zu verbannen.

In 1772, he renews his suggestion and even adds that discoveries „in der wissenschaftlichen Physik" might lend colour to the abstractions of some armchair nature-poets.[230] Again in 1772 and 1773, he calls for a poetry which will use the facts and discoveries of natural history and science, but adds that it still remains to be explained why, despite the great advances in these subjects, the poets of the Orient and of antiquity could make so much better use of images drawn from nature.[231] He tries to explain this himself in 1782, and notes that more primitive peoples have a more intimate and personal view of nature. (This at once reminds us of how he later attempted to link science and art by saying that both of them personify natural agencies.) He writes:[232]

> Ich zweifle nicht, daß aus Copernikus und Newtons, aus Buffons und Priestlei Systemen sich eben so hohe Naturdichtungen machen liessen, als aus den simpelsten Ansichten; aber warum hat man sie nicht? --- Nicht wahr, weil jene [unwißende] Völker in lebendiger Ansicht dichteten, weil sie alles, Gott selbst, sich gleichförmig dachten, die Welt zu einem Hause verengten und in ihr alles mit Haß und Liebe beseelten.

Science and art have both become too abstract and impersonal for such poetry now, he believes. This is true, as most of us would agree. But while

personification and anthropomorphism may help to create great poetry, they cannot but harm science; this Herder apparently failed to realise. He mentions Aikin's "Essay on the Application of Natural History to Poetry"[233] in 1783, but again insists that technical details do not enhance poetry, since they tend to destroy its unity.[234] In 1794, he hails von der Lühe's poem „Flora" with praise, exclaiming:[235]

> --- du bist werth, --- eine neue Stuffe zu betreten, auf der die Wissenschaft der Natur sich mit der Kunst des Gesanges verbindet.

As further examples, he names the ancient Georgics, the works of Spenser, Cowley, Haller, Brockes, Kleist and Thomson, and the "Botanical Garden" of Erasmus Darwin.[236] He renews his appeal for "scientific" poetry with more vehemence in his „Kalligone" of 1800, and, mentioning the discoveries of Herschel and Galvani, asks:[237]

> Wenn der Pythagoräischen, der Orphischen Schule, wenn einem Empedokles, Parmenides und Lukrez die Wunder der Natur, die wir kennen, bekannt gewesen wären, würden sie mit ihnen gespielt haben?

According to the editor of his works, he himself planned to compose a great poem, "De rerum natura",[238] and there seems to be a hint of this scheme in a passage from the „Adrastea" of 1801:[239]

> Erscheint einst ein solches [philosophical and scientific] System, sind die Wahrnehmungen der Astronomie und gesammten Naturlehre, der Chemie und gesammten Naturgeschichte, so wie die Geschichte des Menschen von innen und aussen so gebunden und geordnet, daß in Allen die höchste Reinheit und Einheit, ein Unendliches an Folgen in jedem Punct erscheinet; kein Zweifel, ein solches System ist selbst die reinste und höchste Poesie an Würde und Klarheit.

Here, he seems to be looking for aesthetic qualities in science itself once again, perhaps beginning to doubt whether a new "scientific" poetry will ever appear. But he appeals once more in 1803:[240]

> Im Drange des Systems selbst sind manche ihrer [i.e. Newton's, Dollond's, Herschel's, Linnäus', Haller's, Werner's, etc.] Darstellungen so neu=poëtisch, daß sie gleichsam rufen, zur Handlung mit Empfindung beseelt zu werden.

The words „zur Handlung mit Empfindung beseelt" show that he still believes it is legitimate to personify the natural agencies analysed by science.

It is curious that, in both the preceding quotations, and in several similar ones, the word „System" appears. It is only when a quantity of scientific data is welded into a coherent system that it becomes capable of being rendered poetically. Goethe too realises this when he writes:[241]

> Da im Wissen sowohl als in der Reflexion kein Ganzes zusammen= gebracht werden kann, weil jenem das Innre, dieser das Äußere fehlt; so müssen wir die Wissenschaft nothwendig als Kunst denken, wenn wir von ihr irgend eine Art von Ganzheit erwarten.

Herder is likewise aware that science lacks „das Innre", the dimension of subjectivity, to a great extent. Thus, to become poetry, it must be „mit Empfindung beseelt", as he puts it.

Let us now pause for a word on sources and precedents. As Haym remarks,[242] Hamann had suggested that the discoveries of science might replace traditional mythology in poetry. Herder himself says that Fontenelle had advocated similar ideas,[243] and we know that his own great admiration for Lucretius' poetry must have encouraged him in his wish. But he had read not only Lucretius' poem and the other works he names in the above quotations as examples of poetry based upon natural history and science.

Giordano Bruno, with whose ideas he appears, as we have seen, to have been conversant, wrote several scientific works in verse, in imitation of Lucretius,[244] and, according to the editor of the collection „Aus Herders Nachlaß", the work of Boscovich to which Herder refers in his letter to Lavater in 1772[245] is a didactic, "scientific" poem entitled "De solis ac lunae defectibus". Besides, we already know that it was Herder who persuaded Knebel to translate the work of Lucretius, and he tried to induce another acquaintance to translate Erasmus Darwin's "Botanical Garden".[246] He even suggested to Knebel that he ought to write a poem of his own on nature, following Lucretius' precedent.[247]

But, as Herder early realised, the difficulties in writing a modern poem equal to that of Lucretius were great. In a much discussed lecture, C.P. Snow recently said of such undertakings:[248]

> --- there was a time when "refraction" kept cropping up in verse in a mystifying fashion, and when "polarised light" was used as though writers were under the illusion that it was a specially admirable kind of light.
>
> Of course, this isn't the way that science could be any good to art. It has got to be assimilated along with, and as part and parcel of, the whole of our mental experience, and used as naturally as the rest.

Herder said something very similar in his comments upon Klotz's suggestions in 1768, as well as in later works, as we have seen. Unintegrated technicalities are the destruction, not the making of great art. (Some of the grotesque products of "scientistic" sculpture and painting in recent times are good examples of this.) But even while, in his last years, Herder was calling for a new poetry of science, Goethe was recording the results of his own scientific investigations in poetic form. Even he, in poems such as that

on the metamorphosis of plants, tended to become abstruse in describing the technicalities of his scientific theories in the language of verse, and it is in his poems on the wider aspects of nature, and their significance for man, that he is most successful. As Herder realised, poetry must not lose contact with man and his emotions. And it has become increasingly difficult to write "scientific" poetry not only because didactic poetry in general has passed out of vogue, but also because, as science becomes more abstract and specialised, it becomes harder and harder to relate it to human situations and emotions without distorting it. Nature in the widest sense, especially as it affects our feelings, will always inspire greater art than will the undigested details of pure science.

c) The nature of art and the nature of science.

We have seen that Herder, probably following Kant, classified the mathematical sciences according to „Raum", „Zeit" and „Kraft". In 1768, he carried this scheme over into the arts, and classified them in the same way:[249)]

> --- so wie in der Metaphysik Raum, Zeit und Kraft drei Grund=begriffe sind, wie die Mathematischen Wißenschaften sich alle auf einen dieser Begriffe zurückführen lassen; so wollen wir auch in der Theorie der schönen Wissenschaften und Künste sagen --- [etc.]

Accordingly, the visual arts work within „Raum", the medium of music is „Zeit", and that of poetry is „Kraft". We need hardly repeat that „Kraft" is conspicuous in Herder's theories of art, particularly in the 1770's, just as it is prominent in most of his scientific theories. It is enough to say that, as well as trying to apply science to art and art to science, in many different ways, he used the same theoretical concepts in classifying them

both, thus showing how closely they were connected in his mind.

But art and science are alike not only in their media. Certain formal principles, like the "mathematical" formulae for beauty, are applicable for both. Moreover, art should reflect nature, in Herder's opinion (as any reader of his essays on Shakespeare and Ossian will realise). And art, as he sees it, is usually related to the living, as opposed to the inanimate and "mechanical" world; it is thus understandable that he uses many biological metaphors or analogies in criticising works of art. On one occasion, he speaks of „dieser organische Geist" in the greatest art of antiquity,[250] and, as Clark points out, he "shared Goethe's conception of 'inner form'."[251] Form, for Herder, is not a static, ready-made pattern, but a regularity which emerges from the workings of dynamic forces. In this sense, the form we encounter in nature, particularly in the biological world, is parallel to that which governs all great poetry. Poetic form must never be that of empty convention, but must "grow" out of living experience. In both art and nature, a subtle and eternal order is manifest, even behind apparent chaos. This same spirit inspires all the great poetry of Goethe.

Art and nature are therefore parallel for Herder. Similarly, science, whose object is nature, and all learning devoted to the arts, are complementary. The „schöne Wissenschaften", which, in education, develop the senses and aesthetic discernment, must prepare the way for the „höhere Wissenschaften", the abstract disciplines of knowledge.[252] For, as Herder often says:[253]

Alle Kräfte unsrer Seele sind nur Eine Kraft.

The truly educated mind has learnt to develop and employ them all. In this sense, Goethe too speaks of „höchst erfreulichen Thätigkeiten, wo Kunst und

Wissenschaft, Erkennen und Bilden sich auf sehr hohem Puncte gemeinsam wirkend, zutraulich die Hände bieten."[254] Like Goethe, Herder was convinced that science and art are complementary activities of the human mind, and that neither should lose sight of the other. His views on this are of special interest to us at the present day, since the whole problem is now particularly acute. We have seen that some of the ways in which he associates science and art, nature and the aesthetic, are still worthy of consideration, and that, in these respects, his efforts were by no means unproductive. Other means he adopts or suggests, however, do violence to science, to art, or to both. But his aim is admirable, and we may leave him to pose the final question, which, as he himself suggests, may not be unanswerable:[255]

> Wie aber? Fügen sich auch Wißenschaft und Dichtkunst? ist zwischen Wahrheit und Dichtung, wie zwischen Waßer und Feuer nicht ein ewiger Streit? Nach der neuern Chemie giebt es keine durchaus streitende Elemente; alle nehmen an einander Theil, sie verjagen und ersetzen einander.

Conclusion: man's relation to nature, and the aims and limits of science.

Caroline Herder writes:[256]

> Herder sagte oft: „wenn ich mein eigener Herr wäre, ich würde mich wo einschließen und eine Zeitlang ausschließlich mit Naturwissenschaften beschäftigen."

He was interested in science for its own sake, quite apart from any material benefits which, in the shape of applied technology, it might confer upon man, and from the possibility of exploiting it himself for physico-theological purposes. In his notebooks and works, we find detailed references to such

specialised and often technical writings as Klügel's mathematical disquisition „Über die Figur der Erde",[257] Herschel's articles on the polar regions of Mars and the structure of the universe,[258] Ingenhouß's study of respiration and photosynthesis in plants,[259] Crawford's observations on the conservation of animal heat,[260] and many others. He can have read them only to extend his knowledge and to satisfy his curiosity about the natural world.

However, he believed that the study of science also has a moral worth. Caroline confirms this in her memoirs:[261]

> Er lebte in diesen Ideen; an Auffindung, Verbindung und Harmonie der Gesetze der Natur unter einander und mit dem Ganzen, auch in moralischer Hinsicht, hing seine ganze Seele.

He also quotes with approval the following words of the poet Realis de Vienna:[262]

> Lust zu Natursachen ist ein Merkmal der Großmüthigkeit. Naturkünste machen aufrichtig; Schulkünste stolz und grausam.

Like Bacon, he connected a priori philosophy with Scholastic pedantry and bigotry, which the study of natural science is admirably equipped to dispel. In his „Gott", he also writes:[263]

> Je mehrere Dinge er [i.e. man] kennet; desto besser verstehet er seine eignen Kräfte und der Natur Ordnung; je besser er seine Kräfte versteht, desto leichter kann er sich selbst ordnen und sich Regeln vorschreiben; je besser er die Ordnung der Natur versteht, desto leichter kann er sich vom Unnützen zurückhalten.

The study of nature also tells us about ourselves, for we are linked in every way to the rest of nature, which conditions and sets bounds to our activities.

We have already seen that Herder had great hopes for the advancement of

learning, and that he optimistically believed that technology, despite its many abuses, must produce good effects upon society in the long run. But while his friend Einsiedel looked on science purely from the utilitarian point of view, hoping that technological progress will free the mass of humanity from labour,[264] Herder shared with Bacon other more idealistic hopes. He was able to entertain these because he was certain that, behind even the most chaotic appearances, order somewhere reigns. His own poems, as well as his „Nachdichtungen" and the poems he selected for translation,[265] are full of references to order and harmony in nature. We noticed this, one of his favourite themes, in the last two sections, but we may here cite some lines from his dramatic sketch, „Der entfesselte Prometheus", written in 1802, as a further illustration:[266]

> Im weiten Welten=Raum
> Gehöret Alles Allem. Droben, drunten
> Herrschet ein gleich Gesetz: was irgend lebt
> Und wirkt, wirkt für einander.

Only within the context of the whole universe can we understand the apparent irregularities and arbitrary events which puzzle and oppress us. Chaos exists, but only in a qualified sense; it seems to rule all-powerful in isolated areas of nature whenever we fail to relate these to the law-governed whole:[267]

> Das Chaos der Natur sah niemand --- Chaos und Natur heben einander auf. Die Dichter schildern ihn also nur als einen Uebergang zur Ordnung. [One is reminded of the scheme to reclaim the sea in „Faust", Part II].

If we realise that all nature is basically orderly, we learn to look for order in all things. This, above all, is the task of science for Herder, as the following words, written in 1781, and also quoted by Haym,[268]

reveal:[269]

> Wenn der menschliche Geist in Etwas den Funken seiner Gott=
> ähnlichkeit spürt, so ists in Gedanken, womit er Himmel und
> Erde umfasset, die Sterne wägt, den Sonnenstral spaltet, sich
> in die Geheimnisse der Tiefe wagt, die Körper theilt, die
> Gesetze der Natur erräth und die Unendlichkeit berechnet.

These are religious values („Gottähnlichkeit"), but they are firmly planted in this world. In 1768, in a sermon on the nature of prayer, he exclaims with a burst of poetic sentiment:[270]

> O Herr, --- ich will Dich in der Natur sehen, forschen und
> aufsuchen, und Dich im Frühling und Dich im Sturm des Herbstes
> und im Segen des Sommers und im Schnee des Winters Dich, Herrn
> der Werke Deiner Hände, sehen.

But in the later passage previously quoted, the search for God in nature is no longer primary; man studies nature to realise his <u>own</u> „Gottähnlichkeit". Again in the „Ideen", he says:[271]

> Die verborgensten Kräfte, die er [i.e. der Mensch] von innen
> gar nicht kennet, hat er in ihrem äußern Gange belauscht und
> der Bewegung, der Zahl, dem Maas, dem Leben, sogar dem Daseyn
> nachgespürt, wo er dieselbe im Himmel oder auf Erden nur wirken
> sah. Alle seine Versuche hierüber, selbst wo er irrte oder nur
> träumen konnte, sind Beweise seiner Majestät, einer Gottähnlichen
> Kraft und Hoheit.

These words are filled with a self-confidence like that of the most optimistic thinkers of the Renaissance, who presaged for mankind the most glorious of destinies.

But where order and form are not apparent or fully developed, we further or create them:[272]

> --- das Formlose schätzen wir nur in Absichten, daß es durch uns Form erhalte oder zur Verschönerung unsrer Form diene.

Much remains to be done in this direction:[273]

> Was ist durch Menschen bildbar? - Alles. Die Natur, die menschliche Gesellschaft, die Menschheit. --- Wer wagts die Grenzen zu bestimmen, wie weit die Natur und zwar Alles in ihr cultivirt werden könne und werde?

For although order is always present in theory behind nature as a whole, the separate parts we experience confront us with a gigantic task.

Rouché, on the other hand, declares:[274]

> --- la terre est pour Herder la maison préparée par Dieu pour l'espèce humaine, non un milieu neutre ou hostile qu'il s'agirait de soumettre et d'aménager au mieux. Conception chrétienne de la nature-Création, qui prouve combien, malgré Spinoza, Herder reste fidèle au Dieu de la Bible et de Luther ---

Schwind also writes:[275]

> Zwar ist der Herderschen Kosmogonie der Gedanke an eine Aus= einandersetzung des Geistes mit der Natur fremd, und im besonderen hat in ihr die Vorstellung von einer möglichen Unterjochung der Natur durch den Geist keinen Platz.

We did indeed notice that Herder's mystical leanings led him to describe nature, with its permanent laws, as ultimately complete. But it is also true that his mystical attitudes are by no means passive, and he does not deny that man, as well as everything else, develops. Man himself is certainly the highest product of the rational powers at work in nature:[276]

> --- müßte nicht auch der Vernunftgeist der Schöpfung sich ein Organ bereiten, worin Er wirke?

This passage, written in 1800, shows how unorthodox Herder became in his later years. It implies that the creative power becomes a conscious and free agent only in man, and is obviously akin to the ideas of the Romantic philosophers in the early nineteenth century. Ideas of this kind, with Hegel and others, culminated in the theory that the deity progressively evolves as man becomes more "conscious". It is possible that Schelling, whom Herder read in the 1790's, influenced him here. In 1803, he further writes:[277)]

> Es schlägt ein großes Herz in der Natur.

In these later years, he does seem to have believed that nature becomes conscious only in man, for he had likewise written in 1795:[278)]

> Die ganze Natur erkennet sich in ihm [i.e. dem Menschen], wie in einem lebendigen Spiegel; sie siehet durch sein Auge, denkt hinter seiner Stirn, fühlet in seiner Brust, und wirkt und schaffet mit seinen Händen.

Knebel had also written in the late 1780's:[279)]

> Des Menschen wahres Selbstgefühl ist kein andres, als das die Natur, als Grund und ewige Ursache aller Dinge, aller Ordnung und Vollkommenheit, durch ihn, als durch sich selbst, von sich hat.

It is almost certain that this influenced Herder's views, for he incorporated the passage in a draft for his own „Humanitäts=Briefe", in which the essay of Knebel's here quoted appeared in extract. He rendered the passage, however, as follows:[280)]

> Der Mensch wird die Seele, das Herz, die Hand der Natur, sofern diese auf ihn trift und sich ihm zeiget.

As will be noticed, the qualification („sofern diese ---" etc.) he here places on Knebel's idea is no longer present in the later utterances cited above.

However, man is not only the conscious mouthpiece of nature. He is also its ruler and second creator. This is where we disagree with Rouché and Schwind, who do not qualify their judgements by restricting them to Herder's earlier years (and even then, they do not fully apply). In 1801, he calls man the „Haushalter"[281] of nature. Shortly afterwards, he exclaims:[282]

> Mensch! du bist der Ausleger der Natur, ihr Haushalter und Priester.

And in another passage, he calls man „der Schöpfung Bildner und Vollender",[283] while as early as in 1787, in one of his „Nachdichtungen", he refers to man as a „Priester der Natur".[284] (Hölderlin expressed similar ideas in his „Hyperion", and their influence can be traced as far as Rilke.) We can now see that man is not only the highest product or expression of nature, in a passive sense, for Herder. The following poem illustrates the almost Promethean sentiments of his later years even more clearly:[285]

> Dazu verlieh die große Mutter ihm [i.e. dem Menschen]
> Ihr Wohnhaus; zu ersetzen was gebricht
> Zu ordnen es und zu beseligen.
> Sein Werk ist neue Schöpfung; seine Kunst,
> Sein Ziel die Bildung edlerer Natur.

And the following untitled verses, both in the ideas which they express, and in their poetic merit, which is not inconsiderable, are worth quoting almost in full:[286]

> Von Allem, was der Weltgeist regt und pflegt,
> Hat Er Bedeutung Dir ins Herz geprägt.
> --- Dein innres Wort, Dein Ahnen dieser Spur,
> Nennt Dich, o Mensch, Ausleger der Natur.

Ausleger nur? Nein! Deiner Regung Kraft
Enthüllt in Dir die höh're Eigenschaft
Das Triebwerk der Natur kannst Du allein,
Ihr Meisterwerk, der Schöpfung Schöpfer seyn.
Voll Mitgefühl in Freuden wie in Schmerz
Schlägt in Dir Ihr, der Schöpfung, großes Herz.

Erkenne Dich! Auf Deiner weiten Flur
Ward Deine Brust der Pulsschlag der Natur.
Erfüllen sollst Du, was sie Dir zu thun verließ,
Einholen, was sie Dir zu thun verließ
In Geist und Liebe nur vollendet sie
Sich selbst, der Wesen Einklang, Harmonie.

But nature itself is not passive either. Herder writes in 1793:[287]

> Also stehen ihm [i.e. dem Menschen] oft die Elemente der Natur entgegen, daher er mit ihnen kämpfet --- Alle dies ist ihm in den Weg gelegt, damit ers überwinde.

Goethe wrote over thirty years later:[288]

> Die Elemente daher sind als colossale Gegner zu betrachten, mit denen wir ewig zu kämpfen haben --- hier hat uns die Natur aufs herrlichste vorgearbeitet und zwar indem sie ein gestaltetes Leben dem Gestaltlosen entgegen setzt.

But Herder strikes a somewhat less Faustian note in a poem of 1801:[289]

Daß ihr den Elementen trotzet, ist
Nicht Euer größtes Werk; zu ändern sie,
Sie zu gebrauchen, ist das Größere.

This, of course, brings us back to Bacon, who influenced Herder much more than he did Goethe. "His theme was --- man's progress in achieving his promised dominion over nature", as one of his biographers writes,[290] and man achieves this dominion by using nature, not by defying it.

Herder believed that one of man's tasks in winning control of nature is to develop to the full the capabilities of the animals. He writes in the „Ideen":[291]

> In einem gewissen Kreise haben sich also Menschen und Thiere zusammengebildet: der praktische Verstand jener hat sich durch diese, die Fähigkeit dieser hat sich durch jene gestärkt und erweitert.

And in 1802, he says in his dramatic sketch on Prometheus:[292]

> --- Veredeln sollen
> Die Menschen deine Thiere, sollen sie
> Zum Fleiß erziehen, ja, ist es möglich, ihnen
> Vernunft gewähren ---

Goethe introduces a similar passage in one of his essays on the „Urstier", in 1822:[293]

> Der Umgang, die Pflege des Menschen hat des Urstiers Organisation unstreitig gesteigert.

Herder, however, probably found this idea in the work of the zoologist Zimmermann, who believed that an animal species can reach more advanced levels through the care and good offices of man.[294]

From all this, we can see that Herder, especially in his later years, had great faith in man's ability to control nature, and to improve himself and his whole environment by means of increased knowledge, especially of science. The further he moved away from the religious ideas of his Bückeburg years, the more the influence of Bacon, which is evident in his thought from the earliest date, reasserted itself, and the more he valued science for its own sake, and for the betterment of mankind. His faith in scientific progress was eventually prodigious. He writes in his „Gott" in 1787:[295]

> Die bemerkende Naturlehre, die noch so jung ist, wird in diesem allen [i.e. in the discovery of natural laws] einmal weit reichen, so daß sie zuletzt jede blinde Willkühr aus der Welt verbannen wird ---

Law and order will be discovered in everything.

Yet for all his Baconian optimism and idealism, Herder did believe that science, like all knowledge, has its limitations. Echoing Lessing, he declares in 1787:[296)]

> Die Erforschung der Wahrheit hat den größeren Reitz [sic]; das Haben derselben macht vielleicht satt und träge.

Furthermore, even although he contradicted his theoretical statements in his own practice, he often said that we can never discover the inner nature of the universal „Kräfte". Goethe felt similarly towards his „Urphänomen", and, in 1832, he wrote to the chemist Wackenroder that he thought it the wisest course „das Unerforschliche so in die Enge zu treiben, bis er [i.e. der Mensch] sich dabei begnügen und sich willig überwunden geben mag."[297)] And although Herder, unlike Goethe, was usually not averse to speculating about first and last things, he does say in a sermon in 1780:[298)]

> Unser Beruf ist es nicht, in das Buch Gottes zu spähen, daß wir mit Sorgen auf unsrer Stirn die ferne Zukunft unsres Schicksals zur Gegenwart machen wollen ---

And even though, in his later years, he takes back much of what he had earlier said, he writes of scientific investigations in the same sermon, at the beginning of the most productive period of his maturity:[299)]

> Die Weisheit der alten Zeit war nicht so grübelnd und unendlich, sondern enge und desto tiefer in sich selbst zurückkehrend. Sie wollte nicht hinter den Vorhang Gottes lauschen und aufdecken, was er uns aus zartem schonenden Herzen mit heiliger Nacht bedeckt hat.

For at this time, his pride in man's greatness was qualified by a greater

humility in respect of the limitations of human knowledge.

We have seen that Herder earnestly tried to relate science to the rest of knowledge, and that some of his suggestions are still relevant today. He believed in the importance and value of science, especially in education, more than most thinkers of his age, which still paid more homage to classical traditions than to the study of nature. He saw science as a great historical force, with which man must come to terms, and empirical ways of thinking, encouraged by his studies of nature and science, produced far-reaching effects upon his beliefs, particularly upon his religious convictions, which he tried, with varying success, to reconcile with the naturalistic and scientific sides of his philosophy. Above all, he was filled with an (at times mystical and aesthetic) admiration for the universe as a whole, and for its fundamental order, which he believed that science must progressively reveal. He became more interested in the formal properties of nature as he grew older, paying less attention to „Kräfte", which, however, he always regarded as the agents of natural change. In his last years, he fervently extolled the greatness of man, whose mission, he believed, is to acquire progressive dominion over nature, by learning to understand and apply its laws. In his ideas on the unity of all knowledge and his optimistic views on man and nature, he is greatly influenced by Bacon's philosophy of science, which he studied, quoted and admired from his university years onwards. For us of today, who find it difficult to share to the full the optimism of Bacon and Herder, the lasting value of Herder's ideas on the place of science is that he insisted that it can and must be related to the rest of knowledge, and demonstrated this by his own practical example.

C H A P T E R II

Herder's Place in the Scientific Tradition.

In this chapter, we shall attempt briefly to assess Herder's influence on science and on scientific thought, and to define his place in the scientific tradition.

1. Herder's influence on science.

At the beginning of this study, we pointed out that the historian of science should look first of all to the history of scientific methods, rather than to individual theories, in evaluating the writings of earlier scientific thinkers. Only then can he justly compare particular earlier theories with the results of later investigations, and understand such theories in relation to science as a whole. This procedure is especially necessary in the case of Herder. Too many critics have seized upon particular theories which appear in his works, and compared them unreservedly with their modern equivalents, whereas we have seen that a great many of them rested upon assumptions, such as the qualitative „Kraft" conception, which are incompatible with modern science. Accordingly, we concluded that we should compare Herder's and later scientific thought primarily in terms of general methods and ways of describing natural events. In the latter case, it was possible for us to make direct comparisons between some of Herder's ideas and those of today, whereas his particular theories often resemble their modern counterparts only superficially, lacking exact empirical support.

Bearing the above reservations in mind, we shall now discuss the influence of Herder's particular theories upon later science. Since we have already mentioned many aspects of it in the appropriate earlier chapters, we

need not devote much space to it here.

a) Herder's friends and critics in the scientific world, and the reception of the „Ideen".

First of all, we should realise that Herder had many personal contacts with scientific circles. We have often noticed how, in his professional life as a teacher and in his social affairs, he met various men of science. He was personally acquainted with the great anatomist Blumenbach,[1] with Chladni, the founder of modern musical acoustics,[2] the naturalist and traveller Georg Forster[3] (who offered to collect, on his proposed world-tour, any observations which Herder might find useful), the astronomer von Hahn,[4] the mathematician Lichtenberg,[5] the biologist Sömmering,[6] the celebrated geologist Werner,[7] and many others. Apart from his wide reading in the literature of science, he derived some of his scientific knowledge from such personal contacts. Haym notices that most of his theories were built on the observations of others, and adds:[8]

> --- den Füßen andrer Leute seinen Kopf aufzusetzen - das war sein Ehrgeiz und darin bestand seine Genialität. Fast überall nur ein Nachtreter, wurde er auf diese Weise ein Vortreter. --- So trat er dicht hinter Winckelmann her, um eine neue Theorie der Plastik, hinter Haller, um eine neue Erkenntnißtheorie zu entwerfen. So wurde er der Schüler der Camper und Sömmering, um sich als ihren Lehrer anerkannt zu hören ---

His „Ideen", apart from their philosophical implications (which, as we know, Kant severely criticised), were in fact applauded by several scientists whose subjects were discussed in the work. For although, as Haym notices,[9] Blumenbach emphasised the scientific shortcomings of the work more than most critics, and Lichtenberg actually condemned it as scientifically inadequate,[10]

Camper wrote a well-known letter of praise to Herder,[11] his pupil Herbell dedicated to Herder the second volume of Camper's „Kleinere Schriften",[12] and Sömmering wrote Herder a letter (still unpublished) praising his work.[13] Sömmering actually cited Herder with approval in his „Über die körperliche Verschiedenheit des Negers vom Europäer" in 1785,[14] and Forster wrote to Herder enthusiastically about the „Ideen",[15] although he qualified his praise as follows in a letter to Sömmering:[16]

> --- mir hat das Buch sehr gefallen, bis auf die gar zu sichtliche Anhänglichkeit an sein [i.e. Leibnizian and metaphysical] System von Philosophie, und die Unbekanntschaft mit Naturgeschichte, wo ihn bisweilen die Autorität eines unzuverlässigen Schriftstellers irre geführt hat.

For as we have seen, Herder himself lacked a thorough training in scientific observation and experiment, and he sometimes indiscriminately adopted theories which were already obsolete and discredited. But the great neurophysiologist Gall, whose name has been somewhat unwarrantably associated with that school of pseudo-scientific phrenologists in the early nineteenth century who appropriated many of his ideas, looked on Herder's work with approval, and Caroline remarks:[17]

> Gall hat an mehrern Orten, wo er Vorlesungen hielt, Herders mit Hochachtung gedacht und gesagt, daß ihn seine „Ideen zur Philosophie der Geschichte" auf seine Forschungen und Entdeckungen geführt hätten.

From these facts, we conclude that Herder's „Ideen" did not meet with complete disapproval in the scientific circles of his day, and that several eminent scientists received the work with praise. The influence of his „Ideen" in particular upon those around him was considerable (we have seen

how much the work influenced Goethe), and Knebel writes to him as follows:[18]

> --- wenn ich etwas Gutes hervorbringe, so kann ich es größten= theils als Zweige und Absenker ansehn von dem, was Sie uns gegeben haben.

And finally, it is not commonly realised that Herder was also accorded official recognition for his contributions to scientific thought. Caroline records the following:[19]

> Von andern öffentlichen Ehrenbezeugungen melde ich nur noch, daß er am 23. August 1787 als Mitglied in die königl. Akademie der Wissenschaften zu Berlin --- - 14. Juli 1793 in die physikalische Gesellschaft zu Jena --- aufgenommen worden.

b) Herder's influence on the various sciences.

So far as can be ascertained, Herder's influence upon the physical sciences was negligible. This, of course, is what we should expect, because his imprecise generalisations and his qualitative „Kräfte" rendered most of his physical theories worthless for exact scientific purposes. Only in the fourth „Kritisches Wäldchen", unpublished in his lifetime, are there some more positive ideas, and there are some grounds for agreeing with Zöckler[20] that (in physiological optics and acoustics) he can be regarded, in relation to the state of knowledge in his age, as a „Vorläufer Helmholtzs", although Helmholtz reached his own conclusions independently. In geology, some of his ideas recur in later works, but few of them were original to Herder, and he did not support them with adequate empirical data.

In biology, however, his influence was more considerable. As Witte[21] and Sauter[22] observe, his „Ideen" influenced the biologist Kielmeyer, and through him, his illustrious pupil, the comparative anatomist Cuvier.

Temkin even contends:[23]

> Herder's „Ideen" were the starting point for the whole biological movement around 1800 including not only Kielmeyer but also Goethe, Cuvier and Pfaff.

As we have seen, Herder was probably the first to use the word „Protoplasma" in biology, but it is uncertain whether or not those who later gave it currency had found it in his works. And his interesting observations on animal instinct, set forth in his treatise „Über den Ursprung der Sprache", were taken up and partially refuted by the younger Reimarus, as we earlier noticed, in a later edition of his father's work on the same subject. Besides, F.H. Jacobi's first independent work was entitled „Betrachtung über die von Herrn Herder in seiner Abhandlung vom Ursprung der Sprache vorgelegte genetische Erklärung der thierischen Kunstfertigkeiten und Kunsttriebe".[24] Temkin also notices that Herder is cited by the biologists J.C. Reil, J.F. Meckel (1815), Gall and Spurzheim (1810-19), and von Baer (1864).[25]

Siegel notices that Lotze, in his „Mikrokosmos", renews Herder's anthropological theory that man's upright stature is responsible for many of his characteristically human attributes.[26]

But in general geography, Herder's influence was much greater than in anthropology. Hansen points out that the "botanical geography" for which he appealed in his „Ideen" was eventually established by Alexander von Humboldt.[27] It is well known that Herder significantly influenced the geographer Carl Ritter (1822), especially with his theory of environmental determinism.[28] G. Schwarz, in an article on Herder and Ritter, writes:[29]

> Wenn Herder die geistigen Voraussetzungen für das Entfalten und spätere Aufblühen der geographischen Wissenschaft schuf, so

> wurde Carl Ritter der eigentliche Begründer der wissenschaft=
> lichen Geographie.

Haym also notices that Herder's ideas influenced the geographers F. Ratzel and Paul Lehmann;[30] in fact, Ratzel actually wrote an article on Herder,[31] and quotes him several times in his famous „Anthropo=Geographie" (1882). He approves of Herder's definition of history as an „in Bewegung gesetzte Geographie",[32] and defends his (and Ritter's) "immanent" teleology, saying:[33]

> Der Forscher sucht die Ursachen der Wirkungen zu erkennen, welche den Gegenstand seiner Forschungen bilden, und es kann ihn nicht in diesem Forschen beirren, ob das letzte Ziel dieser Wirkungen ein von höherer Macht gesetztes und ob das Spiel dieser Ursachen und Wirkungen ein von höherer Intelligenz geleitetes sei. Das Wesentliche, auf das allein wir alle ausgehen, ist --- zu erkennen, ob --- die Schicksale der Völker in einem gewissen Maße von ihren Natur=Umgebungen bestimmt sind.

In his article on Herder, Ratzel also says that Herder's influence is apparent in O. Peschel's „Völkerkunde".[34]

We have already seen that Herder's psychological theories had little direct influence upon the progress of psychology, perhaps partly because some of his best psychological observations appear in the fourth „Kritisches Wäldchen", which remained unpublished during his lifetime. But Götz[35] contends that Wundt's ideas reflect some of Herder's, and Schütze claims that Lotze's „Mikrokosmos" "developed further Herder's ideas ---".[36] Furthermore, F.A. Carus, in his „Geschichte der Psychologie" of 1808, shows a considerable knowledge of Herder's works, and praises certain ideas from his „Vom Erkennen und Empfinden", especially the notion that mental functions are distinguishable only in behaviour or „That", and the idea that harmful

psychological effects are produced by the division of labour.[37)]

We conclude that Herder's scientific theories did influence the various sciences in some respects, but that this influence must not be overrated, or presumed where there is no evidence to prove it. Herder was rather a general theorist of science than an exact scientific investigator, and his particular theories could have produced greater effects only if they had been more detailed and supported by quantitative experiment and observation.

c) Herder's influence on Goethe's scientific writings.

In the course of this work, we have studied in considerable detail the influence of Herder's particular theories upon Goethe's scientific writings, so that we need add little here to what has already been said. So far as particular theories are concerned, we have found that Herder influenced Goethe on innumerable occasions.

Haym maintains that Herder, in the „Ideen", is more influenced by Goethe than vice versa,[38)] but Suphan rightly points out that this is untrue, and that there is every indication (including the halting, spontaneously written manuscripts for Part I of the „Ideen") that Herder reached most of his conclusions independently.[39)] Gillies has done much to show that Herder influenced Goethe in countless ways throughout his life,[40)] and Clark too believes that Herder influenced Goethe more than Goethe influenced him.[41)] Rouché says that there was doubtless some reciprocal influence, but that many resemblances between the scientific ideas of the two are resemblances through convergence of thought, since both had drawn upon similar sources.[42)] He rightly observes:[43)]

> Le rôle de Goethe dans l'élaboration des "Idées" a été parfois fort exagéré.

From our own earlier studies, we can agree with this, and conclude that Goethe was much more influenced by Herder in his particular theories than vice versa, while Goethe's influence upon Herder is usually evident in his more general attitudes, making itself felt, for example, when Herder becomes more preoccupied with form than with „Kraft", when his interest in nature, with all its religious implications, increases so greatly in his Weimar years, and when he abandons his teleological and catastrophist theories on the history of the earth. These were tendencies which Goethe undoubtedly encouraged.

But certain of Herder's general attitudes, as well as his particular scientific theories, also influenced Goethe. Jacoby traces Goethe's interest in science back to his association with Herder in Straßburg,[44] and Rasch observes that the ideas of „das Genetische", „das Organische", of development and of dynamic form, all of which are fundamental to Goethe's scientific thought, were all present in Herder's writings by the time of his stay in Straßburg.[45] Haym also points out that Herder's idea of development influenced Goethe as a scientist,[46] and Bruntsch sees traces of Herder's idea of environmental determinism in some of Goethe's scientific writings.[47] If we consider both these wider influences of Herder upon Goethe the scientist as well as the particular ones which we have earlier discussed, it is not too much to say that, without understanding Herder's scientific thought, we cannot fully appreciate that of Goethe, who was more influenced by Herder's ideas than was any other student of science.

2. Herder's influence on the philosophy of science.

In 1828, Goethe calls Herder's „Ideen" „ein vor fünfzig Jahren in

Deutschland entsprungenes Werk, welches unglaublich auf die Bildung der Nation eingewirkt hat."[48] And as we have already said, some of Herder's utterances may now strike us as truisms, but not all of these were truisms when he wrote them. He is himself largely responsible for this change, because his „Ideen" achieved an immense popularity, and many of his thoughts became part of the common heritage of the German mind. So far as his scientific ideas are concerned, the attitudes and methods he brought to the study of nature in the widest sense exercised a greater influence than his particular scientific theories, but because of their very generality, they cannot easily be traced as direct influences upon the works of later thinkers.

However, we can with little difficulty discover Herder's influence in the „Naturphilosophie" of the Romantics. Siegel says that his ideas are little less important for „Naturphilosophie" than for the philosophy of history, and correctly adds:[49]

> Und eben hierin scheint mir vor allem, rein historisch genommen, Herders Stellung in der Geschichte der Naturphilosophie zu liegen ---: Herder läßt als Bindeglied die Kontinuität der Entwicklung von Leibniz über Schelling bis zu unsern Tagen auf das deutlichste hervortreten.

For although Herder was not himself a complete „Naturphilosoph" of the same sort as the Romantics, his philosophy of nature has affinities with their fanciful and often mystical ideas. (On the other hand, he was much influenced by the earlier metaphysical theories of Leibniz, as well as by those of the empirical philosophers such as Bacon, Locke, and the early Kant.) As Haym says, Schelling's philosophy has the same (pseudo-)Spinozistic basis („Spinozismus der Physik") and poetic inspiration as Herder's mature thought, and one of his early works echoes in its title („Ideen zu einer Philosophie

der Natur") that of Herder's masterpiece.[50] Temkin notices the influence of Herder's ideas on ontogeny and phylogeny upon Schelling,[51] and Siegel mentions his „Gott" in particular as a work which helped to shape Schelling's thought.[52] The physicist and Romantic J.W. Ritter was a welcome guest in the Herder household at the turn of the century,[53] and he paid a warm tribute to Herder in his „Fragmente aus dem Nachlasse eines jungen Physikers" of 1810, which Caroline quotes at length in her memoirs.[54] G.H. Schubert, as Walzel notices,[55] was another „Naturphilosoph" who admired Herder; he acknowledges his debt to him in his autobiography.[56] Bürkner says that Baader too was influenced by him,[57] and Wilhelmsmeyer points out that Baader, somewhat like Herder, believed „daß alle Erkenntnis auf Analogie beruhe".[58] Witte says that Oken's „Naturphilosophie" and Steffens' „Anthropologie" renewed Herder's idea of the microcosm,[59] and we may recall that Oken put forward a rather more anthropomorphic version (the "homme anatomisé" idea discussed by Rouché) of Herder's theory of a universal "type"; he was also fond of the idea of polarity and of the mysticism of numbers.[60]

Herder's thought on nature and science will always appeal to those who, like the Romantic scientists, envisage nature, ultimately in a mystical sense, as a unified whole. Haym notices this common tendency in both Herder's „Ideen" and in A. v. Humboldt's „Kosmos". But to depict nature as a whole without falling back upon empty or mystical abstractions means that we must adduce data from many branches of learning, and, as knowledge advances, it becomes increasingly difficult to do so without lapsing into dilettantism. Dilettantism, especially in science, is one of the least praiseworthy features of Romantic „Naturphilosophie". Sell rightly remarks:[61]

Man kann auch von einem Fortwirken der Herderschen universellen

> Geistesrichtung in Verbindung mit dem davon unzertrennlichen Dilettantismus in gewissen deutschen Denkern sprechen. Es sind m.E. C.K.J. Bunsen, Max Müller, Moritz Carriere.

Max Müller was one of many who admired Herder's idea of development, and was among the first to hail him as a precursor of Darwin.[62)]

We have already seen how various general ideas in Herder's scientific thought influenced later thinkers - such were his theory of environmental determinism, his comparative method, and his belief in constant change and development. Ideas of this kind came into general currency in the nineteenth century, and it is extremely difficult to say where Herder's influence is at work, for these are general attitudes and methods rather than specific theories, and their earliest exponents are rarely acknowledged by those who later become indebted to them. The most interesting features of Herder's philosophy of science, however, also include his analogical method, his dialectical formulations, his ideas on teleology, holism and "organicism", and his theories of natural law and what are now called "levels of organisation". It is difficult to say whether he influenced the modern equivalents of these ideas in any way. It seems probable that most of them arose independently in his thought and amongst later theorists, largely as a consequence of that "organic" view of existence which now figures so prominently in philosophies of science, especially those associated with biology. It is worth noticing, however, that one leading "organic" theorist, Joseph Needham, quotes Herder in his work.[63)] Herder's "organic" view of the natural world, with all its ramifications, is his greatest contribution to scientific thought, and we can still find in it much that is valuable.

These, then, are a few of the more obvious ways in which Herder influenced later philosophies of science, especially the „Naturphilosophie" of

the Romantics. A detailed study even of his influence on „Naturphilosophie" would take us beyond the theme and intended length of this work. Nonetheless, there can be no doubt that he directly influenced the „Naturphilosophen" more than any other philosophers of science (apart from Goethe), and in our next section, in which we propose to define his place in the history of scientific thought as a whole, we shall try to explain why his influence did not extend further beyond the nature philosophy of the Romantics than it actually did.

3. Herder's place in the scientific tradition.

In the eighteenth century, two extremes can be distinguished in scientific thought. These are the mechanistic and the spiritualistic (or vitalistic) interpretations of nature. The mechanistic conception, which was fostered by the tremendous advances in mechanics during the previous century, culminated in France in an extreme mechanistic materialism, whose supporters included Holbach and Lamettrie; it proved incapable, with its crude and unsophisticated analogies, of explaining biological and psychological phenomena satisfactorily. The other extreme, which descended from the ideas of Paracelsus, Stahl and others, explained all natural events by means of hypothetical spiritualistic agencies, invisible to the eye. Herder, of course, with his „Kraft", was nearer to the latter extreme than to the former, although, while he rejected mechanism, he was not so implacably opposed to materialism in itself. Nordenskiöld, in his history of biology, admirably summarises the merits and demerits of the spiritualistic conception of nature, and most of his conclusions apply to Herder:[64)]

> This attempt to regard nature as a living entity, to look for connections in phenomena where, when viewed superficially, none

> are apparent, has constituted this tendency's greatest service, besides which the freedom from [text reads "of", which seems to be a misprint] mechanical principles, in many cases, admitted of greater liberty in the interpretation of special phenomena, as Wolff's embryological and Sprengel's botanical investigations proved. The weakness of this spiritualistic view of nature has lain in the frequent desire to solve by mystical formulae problems the solution of which would have required observation and deep thought, and, generally speaking, in its tendency to degenerate into meaningless phrases.

In this respect, Herder is indeed a true precursor of Romantic „Naturphilosophie".

Herder's approach to nature can also be classed as "dynamistic". He belongs to a long tradition of dynamistic theorists of nature, a tradition which extends from Heraclitus and Plotinus to Leibniz, and on to Hegel and later "evolutionary" philosophers, such as Bergson, the psychologist Jung and the supporters of "emergent evolution". All of these have regarded the universe as dynamic, and in the dynamic process, some ideal principle supposedly becomes manifest.

There are two sides to Herder's dynamistic philosophy of nature. There is firstly the „Kraft", the invisible principle behind all natural changes, and secondly, the formal principles by which such changes are described and classified. Herder's „Kräfte" and ideal entities were valueless to science in the long run, although, as we have seen, they once had some use in counteracting over-simplified mechanism. The „Kräfte", like the ideal Chain of Being, were an a priori scheme which broke down as science advanced, although the „Kraft" idea survived in certain vitalistic theories, like those of Driesch, until early in the present century. Since many of Herder's particular scientific theories were based upon metaphysical assumptions of

this kind, they could not long survive the ordeal of empirical tests. But secondly, the formal or methodological side of his scientific thought was of much greater value, and in many ways, it looks out beyond „Naturphilosophie" to modern theories of science. For example, Herder coupled his vitalistic „Kräfte" with dialectical descriptions of natural change. Later, the vitalistic substructure was forgotten, but the "dialectical method" survived, reapplied to pure materialism, in Marxist theories of science. But even the Chain of Being, so far as it encompassed visible forms, was a necessary forerunner of modern systems of classification, and, when it became "temporalised" in the philosophies of Leibniz and Herder, helped to prepare the way for the modern theory of evolution.

Herder's ideas on nature and science are of special relevance to theoretical biology. As we have seen, they were too remote from mathematical and quantitative methods to describe the inanimate world satisfactorily, while they treated psychology as an extension of biology or physiology. When modern biology began to emerge out of natural history, many traditional dualisms broke down, and from Herder's day to ours, biological thinkers, whose interests lie, to use the old dualistic terminology, between matter and mind, have tended to advocate some form of monism. Herder's monism, so far as it depends upon „Kraft", the hypothetical content of the natural world, is closer to mysticism than to modern scientific thought, but in its formal, methodological aspects, it anticipates many later developments. The mystical branch of monism lost itself in the vagaries of Romantic „Naturphilosophie", but the methodological equipment with which it had been associated in Herder's thought points forward to modern "organic" theories of nature. When this equipment was linked to the exact data of observation and experiment, it

produced a way of thinking which has now superseded both mechanism and vitalism in theoretical biology. Herder's (not always consistent) relativism and opposition to anthropomorphic and anthropocentric conceptions, his advocacy of comparative methods and the classification of natural forms according to their relative complexity, his analogical method, his ideas of development and of environmental determinism, his holistic and "organicistic" theories, his final opposition to teleology, his bold but premature attempts to apply mathematical formulae to biological and social changes, his "dialectical method", his theories of natural law and of "levels of organisation" all recur in later philosophies of science, often in relation to biology. Here lay elements of a philosophy of science which was superior both to the mechanism of the French materialists and the mysticism of the Romantics.

But even "organic" conceptions are by no means restricted to theoretical biology. They sprung originally from a monistic attitude, from an unconditional desire to see nature in its entirety as a unitary whole, which, when considered as dynamic, is readily described by the analogy of the organism. In Whitehead's philosophy, "organic" conceptions are applied not just to biology, but to the physical and social worlds as well. Joseph Needham writes in an essay on Whitehead:[65)]

> It may well be that we are on the threshold of a long period, lasting perhaps for several centuries, in which the organic conception of the world will transform society ---

The same writer observes that a fundamental change in this direction has already taken place:[66)]

> This change of view, occupying four hundred years, may be characterised as the transition from Space and Matter as the fundamental notions, to Process conceived of as a complex of Activity with internal relations between its various factors.

In this sense, instead of biology being threatened with engulfment by physical or mechanistic principles, as it was in Herder's day, an attitude normally (but not necessarily) associated with biology is now extended to the physical world and to the universe at large.

Another important influence made itself felt in scientific thought from the late eighteenth century onwards, and particularly in the nineteenth century - the Kantian philosophy. Herder's thought is pre-Kantian in that it lacks a critical epistemology such as Kant gave to the philosophy of science. The problems with which Herder deals are often the same as those which Kant tackled in his mature philosophy, but Herder's solutions are simpler, more unquestioning and more self-confident, for he fails to perceive many of the logical difficulties with which inductive methods are fraught, and he does not clearly distinguish between the logical and the empirical. To this day, "organic" theories of nature and dogmatic monism are open to many logical objections similar to those which can be raised against Herder's philosophy, as Karl Popper and others have shown. We have already reviewed some of these objections in the first part of our present study.

In the great synthesis of knowledge and experience which Herder's ideas on nature and science represent, there are many contradictions, although many of his aims and methods are still valuable. He was filled with a belief in the ultimate unity of all knowledge, and tried to demonstrate this in practice, without allowing one organ of truth to eclipse the others. This makes his thought not only contradictory in itself, but also unusually challenging

to others. Caspar's words on Kepler again apply to Herder:[67]

> In his mind are crossed and intertwined teleological and physical principles, induction and deduction, unconditional veneration for the facts and a passionate desire for a priori thinking, theological and mathematical speculations, Platonic and Aristotelian points of view.

His unstable synthesis did not outlive him, but elements of it reappear in many later philosophies of science, including those of Romantic „Natur=philosophen", dialectical materialists, evolutionary monists, modern biological vitalists, and supporters of holism and "organicism". Herder dealt with very many of the problems which will always confront the scientific thinker, and as Witte says, his answers can still help us today „im Gewirre der oftmals in merkwürdiger Weise verschobenen Stellung der Probleme uns zu orientieren und ihnen gegenüber an der Hand eines tiefblickenden und reich gebildeten Geistes einen sicheren Halt gewinnen zu lassen."[68]

C O N C L U S I O N.

We have seen that, in Herder's philosophy of nature and science, the formal principles he uses to describe and classify natural phenomena are his greatest contribution to the scientific tradition, and that, from the point of view of today, his particular scientific theories are of secondary importance. Nonetheless, these theories are backed up by a very extensive reading, and they provide us with a remarkably full picture of the state of science in the eighteenth century and the age of Goethe. We have also seen that we must study them in detail if we wish fully to appreciate Goethe's scientific works, which were more profoundly influenced by Herder's ideas than has hitherto been suspected.

As for influences at work upon Herder, it has emerged in the course of this study that the earlier ideas of Kant, Herder's old teacher, were by far the greatest single influence upon his own scientific thought, even in matters of detail. On a more abstract level, the influence of Leibniz is only slightly less obvious.

Herder, we have found, was neither an exact scientific investigator nor a theologian bent upon imposing his beliefs upon the scientific world. This becomes clear if we study him first and foremost within the context of his own age, and do not seek to interpret his works exclusively in terms of later problems or to read our own favourite ideas into them. Since it lay in his innermost nature to try to reconcile the many conflicting areas of his wide knowledge and experience, his thought is complex, often contradictory, and imprecise in detail. But his unwavering belief that all knowledge is connected and that science is an essential, but by no means exclusive organ of truth, is still an inspiration to us today.

However, his scientific thought has, on the whole, been much neglected. For this, there are two main reasons. Firstly, it has been thought that his adversary Kant had shown that his theories of nature and science are fundamentally misguided; and secondly, too many modern critics have made the mistake of searching in his works for modern scientific theories, especially for a "Darwinian" theory of evolution, whereas it transpires that they are simply not there. But on the one hand, Kant's criticisms detract but little from the most valuable part of Herder's scientific thought, from that methodological equipment which, as we have shown, has since been inherited by modern scientific thinkers; on the other hand, the discovery that Herder is not a Darwinist merely proves what certain critics should have recognised from the start, that he is not an exact scientist and that historians of science should look first to the history of scientific methods before trying to find "precursors" for every modern discovery which improved techniques and an increased knowledge of the natural world have made possible. Neither of these objections invalidates what is enduring in Herder's scientific thought, although they have caused it to be neglected more than it has deserved. Many of his methods and aims are still relevant today, because he grappled with problems many of which still confront us. But he was seldom completely satisfied with his own conclusions. This explains why so many of his works are unfinished, several times revised, or full of contradictions. They have been, and always will be peculiarly stimulating to later generations, largely because they leave as many questions unanswered as problems solved. And as Herder himself says:[69)]

> Die Fragen eines Gestorbenen müssen nicht mit ihm gestorben seyn; dazu ist Schrift und Buchdruckerei, dazu sind <u>wir</u> da.

Notes to text (Vol. 2)

(See the beginning of notes to Vol. 1 for list of abbreviations etc. used in notes.)

Part II, Chapter I.

1. Caroline 69 I p.56.
2. Bibl. Herd. 4 Nr. 2585, 3076, 3077, 3079, 3081, 3088-9, 3095, 3372-3, 3629-36.
3. SWS 4, 346 & 391 etc.
3a. Hoffmann 37 p.17, to Hamann, 21st May 1765.
4. Clark 79 p.750.
5. Siegel 176 p.130.
6. op.cit. p.139.
7. Caroline 69 III p.196.
8. SWS 13, 180.
9. Richter 111 p.13.
10. Götz 82 p.12.
11. Hoffart 152 p.39.
12. SWS 16, 548.
13. e.g. Schütze 173 XXI p.48; also Blumenthal 139 p.36.
14. Lebensbild 34 III p.365.
15. SWS 32, 197 and editor's note; c.f. SWS 12, 367.
16. Haym 68 I p.295.
17. Siegel 176 p.137; c.f. id., p.139.
18. Haym 68 I p.295.
19. Lebensbild 34 V p.112.
20. SWS 4, 105.
21. c.f. Nordenskiöld 230 p.22.
22. Kühnemann 18 p.XXXIII.
23. Lange 196 I p.401.
24. e.g. SWS 16, 453; also id., 16, 480; 16, 546; c.f. SWS 14, 274.
25. SWS 13, 173.
26. SWS 14, 274.
27. SWS 23, 517.
28. Leibniz 304 p.618.

29. McEachran 72 p.67.
30. Posadzy 168 p.46.
31. see Jeans 225 p.54; c.f. Singer 236 p.59.
32. Schmidt 172 p.15.
33. SWS 14, 641.
34. SWS 8, 250, Vom Erkennen und Empfinden, 1774 version.
35. SWS 8, 193.
36. SWS 20, 370.
37. SWS 32, 217.
38. SWS 14, 527.
39. SWS 16, 450-451.
40. loc.cit.
41. Leibniz 304 p.618.
42. SWS 16, 564.
43. SWS 23, 518.
44. c.f. Jammer 224 p.170.
45. loc.cit.
46. Lange 196 II p.220.
47. Martin 197 p.92.
48. Russell 204 p.125.
49. Popper 202 p.29.
50. Noll 106 p.336.
51. Berger 137 p.119.
52. H. Schwarz, Die Entwicklung des Pantheismus in der neueren Zeit, Zeitschrift für Philosophie und philosophische Kritik, Bd. 157, p.59, note 1.
53. Hoffart 152 p.40.
54. Rouché 170 p.386.
55. Berger 137 p.119.
56. Clark 79 p.743.
57. SWS 8, 194; c.f. SWS 8, 196. Vom Erkennen und Empfinden.
58. SWS 16, 454, Gott.
59. Clark 79 p.750.
60. op.cit. p.752.
61. op.cit. p.741.
62. c.f. Engels 193 p.71 on these distinctions and disputes over them in the eighteenth century.

63. SWS 8, 169, Vom Erkennen etc., quoted Clark, loc.cit.

64. Engels 193 p.134.

65. I.A. Richter (ed.)., Selections from the Notebooks of Leonardo da Vinci, London, O.U.P., 1952, p.63.

66. Jammer 224 p.124.

67. op.cit. p.178.

68. op.cit. p.203.

69. op.cit. p.229.

70. Whitehead 207 pp.72 & 82.

71. SWS 13, 170.

72. Posadzy 168 p.53.

73. Hansen 85 p.23.

74. SWS 13, 426.

75. Vielhaber 130 p.101.

76. Clark 66 p.315.

77. Siegel 176 p.154.

78. SWS 13, 176.

79. SWS 21, 137.

80. c.f. McEachran 72 p.80.

81. Lucretius 307 I p.28; c.f. Herder's note, SWS 14, 660: „Nichts geht unter, es kommt ein Anderes."

82. Novum Organum II Aphorism XL, quoted in Masson 228 p.116.

83. Masson 228 p.116.

84. Singer 236 p.258.

85. Bell 211 p.113.

86. Jammer 224 p.103.

87. Jeans 225 pp.166 & 168.

88. Kant 287 p.58.

89. We need not discuss how all other conservation laws were subordinated to that of the conservation of energy in the present century.

90. SWS 7, 382; c.f. SWS 8, 255 & id., 23, 513.

91. Bertalanffy 190 p.151.

92. Berger 137 p.8.

93. Bruntsch 78 p.7.

94. Boucke 77.

95. Barnard 135 p.65.

96. SWS 32, 214, early sketch „Wahrheiten aus Leibnitz".
97. c.f. Thienemann 237 p.234.
98. c.f. Kant 290 p.17.
99. op.cit. p.20.
100. c.f. Jammer 224 pp.141-142.
101. op.cit. p.65.
102. Dalberg 261 p.6.
103. Jammer 224 p.208.
104. c.f. SWS 23, 513 et seq., Adrastea.
105. Varnhagen 58 III p.456.
106. SWS 21, 66, Metakritik.
107. SWS 13, 174-175, Ideen.
108. SWS 13, 421.
109. c.f. SWS 13, 269 for Herder's acknowledgement of Gmelin.
110. Herder's MSS S.P.K. D.S.T. Kapsel XXVIII Nr. 6.
111. c.f. Bode 250 p.569.
112. Düntzer 26 II p.20, Herder to Lavater, 30th October 1772.
113. Herder's MSS N.F.G. (G.S.A.) Anfangsgründe der Sternkunde pp.23 & 45.
114. Schmidt=Cürtow 117 p.147.
115. SWS 8, 197.
115a. SWS 16, 548.
116. Pistoi 313 p.51.
117. op.cit. p.89.
118. Euler 264 II p.265.
119. Haller 274 p.201.
119a. c.f. Nordenskiöld 230 p.327.
120. SWS 13, 175.
121. loc.cit.
122. SWS 8, 190-191, Vom Erkennen und Empfinden.
123. SWS 13, 77.
124. SWS 13, 78.
125. SWS 8, 291.
126. SWS 13, 176, Ideen Pt. I.
127. Rouché 170 p.180.
128. Shaftesbury 317 II pp.378-379.

129. op.cit. II p.366.
130. Unger 183 p.267; c.f. Pamp 166 pp.24-27.
131. SWS 4, 373.
132. see Dessoir 216 I p.506.
133. c.f. Whittaker 239 I p.19.
134. see Zöckler 243 II p.208.
135. c.f. Engels 193 p.247.
136. c.f. Haym 68 I p.506.
137. SWS 21, 51 & 57, Metakritik.
138. SWS 21, 52.
139. SWS 21, 59; c.f. SWS 5, 228.
140. SWS 5, 228.
141. Kant 283 p.361.
142. SWS 16, 454.
143. SWS 18, 379.
144. SWS 31, 653.
145. SWS 16, 542.
146. SWS 21, 53 & 61.
147. c.f. A. Koyré, From the Closed World to the Infinite Universe, Baltimore, 1957, p.189.
148. Barnard 135 p.61.
149. SWS 13, 29.
150. SWS 13, 32.
151. loc.cit.
152. Goethe 267 XII p.77, Versuch einer Witterungslehre.
153. e.g. Bailly, Bode, Boyle, Bradley, Brahe, Cassini, Copernicus, Descartes, Euler, Fischer, Flamsteed, Galileo, von Hahn, Hamberger, Herschel, Hevelke, Huygens, Kästner, Kant, Keill, Lagrange, Lambert, Laplace, Lichtenberg, Maupertuis, Olbers, Piazzi, Schröter, Schubart, Weidler, Wilkins, Wright, von Zach, etc.
154. Bibl. Herd. 4 Nr. 3086, 3098, 3624, 3627, 4689, etc.
155. e.g. SWS 15, 278; SWS 24, 573, etc.
156. Stokar 55 p.236, G. Müller to J.G. v. Müller, 31st December 1803.
157. Herder's MSS N.F.G. (G.S.A.), unpubl. MS „Anfangsgründe der Sternkunde".
158. ditto p.23.
159. ditto p.37.
160. c.f. Encyclopaedia Britannica, 13th edn., article "Venus".

161. Rouché 170 p.185.
162. Grundmann 84 p.25.
163. This idea recurs in another of Herder's works in 1785 (SWS 15, 278).
164. c.f. Düntzer 28 II p.245, F.L.W. Meyer to Herder, 23rd Sep. 1787.
165. Herder's MSS S.P.K. D.S.T. Kapsel XXVIII Nr. 6.
166. SWS 24, 573. This work appeared in the „Taschenbuch für das Jahr 1803".
167. SWS 16, 49, Zerstreute Blätter.
168. SWS 23, 518.
169. c.f. SWS 23, 526.
170. c.f. SWS 23, 524.
171. Jammer 224 p.139.
172. op.cit. p.260.
173. Bibl. Herd. 4 Nr. 2986, 3092, and 3580.
174. Herder's MSS N.F.G. (G.S.A.), Anfangsgründe der Sternkunde p.44.
175. Kant 283 p.243.
176. SWS 23, 522.
177. SWS 14, 642.
178. Rouché 170 p.187.
179. SWS 14, 583.
180. Haym 68 I p.587 quotes this statement.
181. SWS 8, 264.
182. SWS 9, 537, Über die dem Menschen angeborne Lüge.
183. SWS 13, 479.
184. c.f. Kant 283 p.358.
185. c.f. Jeans 225 pp.50-51 on Aristotle.
186. c.f. Macgillivray 227 p.302 on Linneus.
187. SWS 18, 290.
188. SWS 23, 515.
189. SWS 23, 509.
190. SWS 23, 542.
191. c.f. Zöckler 243 II p.241.
192. c.f. Jammer 224 p.47.
193. c.f. H. Hallam, Introduction to the Literature of Europe in the 15th, 16th & 17th Centuries, London, 1837-1839, Vol. II pp.463-464.
194. op.cit. Vol. III pp.148-149.
195. c.f. Lovejoy 226 p.119.

196. op.cit. p.102 note.
197. Jammer 224 pp.81-90.
198. op.cit. p.90.
199. SWS 23, 525.
200. SWS 23, 515.
201. SWS 23, 520-521.
202. SWS 23, 522.
203. Goethe 267 XII p.81, Versuch einer Witterungslehre.
204. SWS 13, 402, Ideen.
205. SWS 32, 199, Aphorismen, c. 1769-1771.
206. SWS 4, 354.
207. Gillies 16 p.130.
208. Schauer 51 II p.162.
209. Düntzer 26 II p.21, to Lavater, 30th October 1772.
210. SWS 8, 170, Vom Erkennen etc.
211. SWS 8, 287, Vom Erkennen etc., 1775 version.
212. c.f. Macgillivray 227 p.312.
212a. c.f. Pamp 166 p.24.
213. SWS 13, 29.
214. SWS 13, 46.
215. Bode 250 p.554.
216. SWS 13, 268.
217. SWS 13, 402.
218. SWS 14, 576, Ideen.
219. SWS 15, 316, Liebe und Selbstheit.
220. c.f. Schauer 51 I pp.248 & 263, to Caroline, 22nd June & 2nd July 1771.
221. c.f. Düntzer 26 II p.300, Caroline to Jacobi, 11th Nov. 1792, and Düntzer 28 I p.151, Herder to Gleim, 12th Nov. 1792.
222. see Herschel 280 p.139.
223. Cajori 213 p.121.
224. op.cit. p.71.
225. SWS 4, 346 & 374.
226. Whittaker 239 I p.50.
227. c.f. Engels 193 pp.82 & 87.
228. Bibl. Herd. 4 Nr. 3093, 3116, 3615 and 44.
229. SWS 16, 559.

230. c.f. Nordenskiöld 230 p.276.
231. c.f. Suphan's remark, SWS 14, 664.
232. SWS 14, 682.
233. SWS 13, 476.
234. loc.cit.
235. c.f. Düntzer 28 II p.241, F. Meyer to Herder, 19th Nov. 1786.
236. SWS 13, 29.
237. c.f. Euler 264 I p.243.
238. SWS 13, 266.
239. loc.cit.
240. SWS 13, 470 et seq., esp. p.478.
241. Varnhagen 58 II p.304, to Knebel, early October 1794.
242. SWS 14, 608; c.f. SWS 14, 672.
243. Irmscher 17 p.288.
244. Düntzer 26 II p.20, to Lavater, 30th Oct. 1772.
245. Baechtold 21 p.74.
246. SWS 13, 46.
247. SWS 13, 48.
248. e.g. SWS 13, 175; also id., 13, 420 & 426 etc.
249. SWS 13, 421.
250. SWS 13, 175.
251. SWS 13, 175; also id., 13, 420; 14, 584.
252. SWS 31, 243.
253. SWS 13, 420.
254. loc.cit.
255. Herder's MSS N.F.G. (G.S.A.) Anfangsgründe der Sternkunde p.26.
256. Düntzer 26 II pp.19-21, to Lavater, 30th Oct. 1772.
257. SWS 12, 6.
258. SWS 13, 29. The word „Lichttheile", however, may indicate a qualified acceptance of the corpuscular theory.
259. Düntzer 28 II p.359, Einsiedel to Herder, 11th Sep. 1778.
260. SWS 23, 538.
261. SWS 23, 528.
262. Jeans 225 p.209.
263. op.cit. p.123.
264. SWS 23, 528.

265. Haym 68 II pp.784-785.
266. Varnhagen 58 II p.276, to Knebel, 23rd Nov. 1798.
267. Schelling 315 p.37.
268. Schelling 316 p.12.
269. loc.cit.
270. see note 222 above.
271. Bode 250 p.554.
272. c.f. SWS 13, 14, Herder's note.
273. SWS 23, 529.
274. von Hahn 269.
275. c.f. H. Hallam, Introduction to the Literature of Europe in the 15th, 16th & 17th Centuries, London, 1837-1839, Vol. IV pp.27-28.
276. SWS 23, 528-529.
277. Herschel 280 p.142.
278. SWS 23, 529.
279. loc.cit.
280. SWS 23, 533.
281. SWS 23, 534.
282. SWS 23, 532.
283. c.f. SWS 14, 608.
284. SWS 24, 574.
285. c.f. Wolf 241 p.669.
286. SWS 4, 85-86.
287. Herder's MSS N.F.G. (G.S.A.) Anfangsgründe der Sternkunde p.8.
288. Clark 66 p.95.
289. SWS 4, 85.
290. SWS 5, 48.
291. SWS 4, 61, editor's note.
292. Smith 318 p.49.
293. op.cit. p.51.
294. Berkeley 247 pp.32 & 80.
295. op.cit. p.16.
296. SWS 4, 93.
297. Herder's MSS S.P.K. D.S.T. Kapsel XXVIII Nr. 7.
298. SWS 8, 156.
299. SWS 21, 97, Metakritik.

300. SWS 15, 525, Zerstreute Blätter.
301. SWS 8, 193.
302. Goethe 267 I p.XXXI, Farbenlehre, 1807.
303. SWS 13, 349.
304. SWS 15, 526, Zerstreute Blätter, 1787.
305. Schütze 118 p.24.
306. SWS 4, 458.
307. SWS 8, 118.
308. SWS 22, 67, Kalligone.
309. Euler 264 I p.158.
310. loc.cit.
311. Goethe 267 I p.152, Farbenlehre, 1807.
312. c.f. SWS 29, 529, „Eine Bilderfabel für Goethe. März, 1773".
313. c.f. SWS 20, 40 and SWS 23, 523.
314. Hoffmann 37 pp.74-75, to Hamann, 2nd Jan. 1773.
315. SWS 8, 101.
316. c.f. Goethes Werke, Hamburger Ausgabe, Bd. 13 p.605, editor's note.
317. Goethe 32 IX p.261, 18th May 1791.
318. see note 316 above.
319. Düntzer 28 I p.145, 6th Nov. 1791.
320. c.f. Haym 68 II p.461.
321. Düntzer 28 II p.218, May, 1792.
322. Wahle 62.
323. Aristotle believed that colours are mixtures of light and "darkness"; c.f. Singer 236 p.299.
324. SWS 22, 59.
325. SWS 22, 60-61.
326. loc.cit., editor's note.
327. Euler 264 I p.103.
328. SWS 24, 435. The essay was written in 1802.
329. loc.cit.
330. SWS 24, 436.
331. loc.cit.
332. c.f. note 315 above.
333. SWS 24, 436.
334. SWS 24, 437.

335. SWS 24, 436.
336. loc.cit.
337. SWS 24, 438.
338. SWS 22, 59-60.
339. Goethe 267 I p.28, Farbenlehre, 1807.
340. SWS 24, 438.
341. loc.cit.
342. SWS 24, 439.
343. loc.cit.
344. SWS 24, 438.
345. Haym 68 II p.784.
346. op.cit. II p.785.
347. Euler 264 I p.35.
348. c.f. SWS 4, 90 & 101, fourth „Kritisches Wäldchen".
349. The first six writers are named in SWS 4, 90.
350. e.g. SWS 22, 66.
351. c.f. Hesse 194 p.77.
352. c.f. Wolf 241 p.164. Newton had also compared the spectrum and the octave.
353. Euler 264 I p.127.
354. SWS 4, 102.
355. SWS 8, 101.
356. SWS 22, 66.
357. c.f. Düntzer 29 II p.41, Caroline to Knebel, 25th Jan. 1803.
358. SWS 8, 39; c.f. id., 22, 68 and 24, 440.
359. SWS 24, 437.
360. SWS 24, 437 & 439.
361. Goethe 267 I p.301, Farbenlehre, 1807.
362. Düntzer 28 III p.165, to Herder, 9th June 1800.
363. Haym 68 II p.785.
364. op.cit. II p.704.
365. c.f. Cajori 213 p.101.
366. c.f. Whittaker 239 I p.50.
367. c.f. Masson 228 p.93.
368. c.f. Cajori 213 p.113.
369. c.f. Singer 236 p.350.

370. loc.cit.
371. c.f. Whittaker 239 I p.39.
372. SWS 23, 538.
373. Bode 250 p.554.
374. SWS 24, 439.
375. c.f. Cajori 213 p.114.
376. Whittaker 239 I p.99.
377. SWS 23, 530, Adrastea.
378. von Hahn 268 p.107.
379. SWS 13, 48.
380. Varnhagen 58 II p.276, Herder to Knebel, 23rd Nov. 1798.
381. Düntzer 28 III p.130, Knebel to Herder, 26th Jan. 1799.
382. Herder's MSS S.P.K. D.S.T. Kapsel XXX Nr. 1, Aufzeichnungen zum Unterricht in der Physik.
383. SWS 14, 655.
384. SWS 13, 430.
385. SWS 13, 422.
386. SWS 14, 623, Herder's classified notes for „Ideen".
387. Linneus 306 p.6.
388. Pistoi 313 p.2.
389. Goethe 267 VIII p.249, Skelette der Nagetiere, 1824.
390. SWS 16, 558, Gott, 1787.
391. c.f. Masson 228 p.135.
392. op.cit. p.133.
393. SWS 14, 588.
394. SWS 13, 58.
395. SWS 13, 211.
396. Kant 284 p.103.
397. SWS 24, 439, Herder's essay on colour, 1802.
398. Düntzer 28 II p.174, Herder to Heyne, 5th Sep., 1774.
399. Pistoi 313 p.15.
400. Düntzer 28 III p.52, to Herder, 7th Sep. 1789.
401. Dobbek, in Einsiedel 263 p.58.
402. Bibl. Herd. 4 Nr. 3595.
403. Herder's MSS S.P.K. D.S.T. Kapsel XXVIII Nr. 6, extracts from Mann's work on „Elementarfeuer".

404. c.f. Düntzer 28 II p.282, to Knebel, 30th Nov. 1799.

405. Bibl. Herd. 4 Nr. 379.

406. SWS 23, 85.

407. SWS 24, 438.

408. SWS 14, 585.

409. c.f. Baechtold 21 p.33. Georg Müller mentions that Schröter, a keen geologist, preached in Herder's church one Sunday.

410. c.f. SWS 20, 253, editor's note; c.f. also SWS 22, 235 note; also Düntzer 26 II pp.454-455, to August Herder, 1800.

411. SWS 6, 186.

412. SWS 6, 296.

413. SWS 31, 294.

414. SWS 13, 428-429.

415. SWS 16, 52.

416. Kant 283 p.313.

417. Kant 291 p.267.

418. SWS 1, 116; also id., 6, 197; 13, 471.

419. c.f. Zöckler 243 II p.158.

420. Bruntsch 78 pp.10-13.

421. SWS 13, 421, Ideen.

422. SWS 14, 695.

423. SWS 13, 33; also id., 13, 35; 13, 40-41; 13, 48; 13, 208; 13, 397; 13, 419; 13, 471; 14, 571; 14, 575; 14, 578; 14, 584; etc.

424. SWS 13, 397; c.f. Goethe 267 IX p.175, Über den Granit.

425. Adams 209 pp.365-377.

426. op.cit. p.218.

427. op.cit. p.388.

428. op.cit. p.379.

429. Sauter 116 p.17.

430. Rouché 170 p.187.

431. Linneus 305 p.153.

432. Isaiah Chap. 14 verse 13.

433. Wagner 59 p.369, to Merck, Nov. 1782.

434. SWS 13, 46.

435. SWS 13, 402; c.f. SWS 17, 219.

436. SWS 13, 46; also id., 13, 69; 13, 213; 13, 403.

437. Grundmann 84 p.32.

438. Pallas 312 p.25.

439. op.cit. p.40.

440. SWS 13, 35.

441. Grundmann 84 p.32.

442. Düntzer 26 II p.124, to Lavater, 20th Feb. 1775.

443. SWS 14, 571.

444. Adams 209 p.75.

445. I.A. Richter (ed.), Selections from the Notebooks of Leonardo da Vinci, London, O.U.P., 1952, p.32.

446. Rouché 170 p.187.

447. Woodward 242 p.29.

448. op.cit. p.80.

448a. G. Gamow, Biography of the Earth, Its Past, Present and Future, New York, 1941, revised edn. London 1959, pp.43 & 56.

449. c.f. Zöckler 243 II p.138.

450. c.f. H. Hallam, Introduction to the Literature of Europe in the 15th, 16th & 17th Centuries, London, 1837-1839, Vol. IV p.590.

451. c.f. Nordenskiöld 230 pp.223-224.

452. SWS 6, 120.

453. SWS 13, 419.

454. SWS 13, 480.

455. c.f. Nordenskiöld 230 p.270.

456. Kant 283 p.289.

457. SWS 13, 471.

458. SWS 14, 213.

459. SWS 13, 419.

460. SWS 14, 584.

461. SWS 13, 397.

462. c.f. SWS 13, 480.

463. SWS 13, 29.

464. SWS 14, 584.

465. c.f. Willey 240 p.31.

466. c.f. Sauter 116 p.71.

467. c.f. Zöckler 243 II p.142.

468. Adams 209 pp.221-223.

469. SWS 13, 234.

470. SWS 13, 402.
471. SWS 13, 216.
472. SWS 13, 64.
473. Kohlbrugge 93 p.1114.
474. Lucretius 307 II p.537.
475. Sauter 116 p.65.
476. Kant 285 p.203.
477. Goethe 267 II p.96, Lage der Flötze, c. 1829.
478. SWS 13, 422.
479. c.f. Zöckler 243 II p.122.
480. Pallas 312 p.53.
481. SWS 13, 480.
482. loc.cit.
483. c.f. Willey 240 p.31.
484. SWS 13, 17.
485. SWS 13, 27.
486. SWS 13, 41-42.
487. SWS 13, 28.
488. Rouché 170 p.193.
489. SWS 16, 456.
490. Kant 283 p.347.
491. SWS 13, 480.
492. SWS 13, 477.
493. c.f. Willey 240 p.31.
494. c.f. Zöckler 243 II pp.159 & 188.
495. op.cit. II p.141.
496. c.f. Woodward 242 p.9.
497. Rouché 170 p.193.
498. SWS 6, 197, Älteste Urkunde.
499. c.f. Zöckler 243 II p.101.
500. Kant 283 p.288. The same theory appears in his physical geography lectures, attended by Herder (c.f. Kant 291 p.305).
501. c.f. Kant 283 p.289.
502. loc.cit.
503. SWS 30, 397, Plan zum Unterricht des jungen Herrn von Zeschau.
504. SWS 11, 389, Vom Geist der ebräischen Poesie.

505. SWS 13, 483.
506. Bruntsch 78 pp.18-19.
507. op.cit. p.23.
508. SWS 13, 478.
509. SWS 13, 476-477.
510. SWS 13, 477, etc.
511. e.g. SWS 13, 479.
512. SWS 13, 399.
513. SWS 14, 214.
514. SWS 13, 21.
515. SWS 13, 481.
516. Bruntsch 78 p.20.
517. c.f. Adams 209 p.400.
518. op.cit. p.331.
519. Lucretius 307 II p.681.
520. Adams 209 p.402.
521. op.cit. p.335.
522. Pallas 312 p.58.
523. c.f. Koller-Du Bos 262 p.102.
524. c.f. SWS 14, 575.
525. SWS 32, 153 et seq.
526. SWS 11, 249, editor's note.
527. SWS 32, 153; c.f. SWS 11, 249.
528. SWS 32, 154.
529. SWS 6, 113, Archäologie des Morgenlandes.
530. SWS 11, 388, Vom Geist der ebräischen Poesie.
531. SWS 13, 436-437.
532. SWS 14, 571-572.
533. SWS 13, 473.
534. SWS 13, 475.
534a. Wells 133 p.107.
535. Zöckler 243 II p.123.
536. c.f., however, Voltaire's (probably disingenuous) contention that fossil shells are really pious relics dropped by pilgrims returning from the Holy Land.
537. c.f. Zöckler 243 II pp.126-128 & 177.

538. c.f. I.A. Richter, Selections from the Notebooks of Leonardo da Vinci, London, O.U.P., 1952, p.30.
539. c.f. Zöckler 243 II p.140.
540. op.cit. II p.172.
541. SWS 13, 474.
542. SWS 13, 475.
543. c.f. Kant 291 p.304.
544. Pallas 312 pp.52-53.
545. SWS 13, 426, Ideen.
546. SWS 14, 576.
547. Wagner 59 p.242, to Merck, 30th Apr. 1780.
548. c.f. Koller-Du Bos 262 p.110.
549. c.f. Woodward 242 p.17.
550. Kant 288 p.427.
551. SWS 14, 573; c.f. SWS 14, 578-580.
552. Pallas 312 pp.51 & 56.
553. SWS 13, 482.
554. Herder's MSS S.P.K. D.S.T. Kapsel XXVIII Nr. 6.
555. Bibl. Herd 4 Nr. 3603, 3604 and 7009.
556. SWS 11, 388.
557. c.f. SWS 14, 673, Suphan's remark.
558. SWS 14, 621; c.f. Suphan's words in SWS 14, 690.
559. SWS 14, 582.
560. SWS 13, 315.
561. SWS 13, 271.
562. SWS 14, 694, quoted by Suphan.
563. Schwedische Abhandlungen 244 V p.25.
564. op.cit. V pp.25 & 34.
565. c.f. Nordenskiöld 230 p.224.
566. Linneus 305 p.153.
567. c.f. Nordenskiöld 230 p.328 note.
568. R. Carrington, A Guide to Earth History, London, 1956, p.177.
569. SWS 14, 700. Suphan quotes this letter to Zelter of 1829.
570. Caroline 69 III p.109.
571. Noll 106 p.332.
572. SWS 13, 24.

573. Bibl. Herd. 4 Nr. 3090, 3589-90, 3594, 3597, 3599, 3601, 3602, 3605, 3611.

574. Hoffmann 36 p.181, to J. v. Müller, 2nd Feb. 1807.

575. op.cit. p.181 note.

576. c.f. SWS 13, 470, Suphan's note.

577. SWS 16, 117.

578. SWS 13, 22.

579. Caroline 69 III p.195.

580. Grundmann 84 p.30.

581. Herder's MSS N.F.G. (G.S.A.) Anfangsgründe der Sternkunde p.45.

582. SWS 13, 426-427.

583. Kant 283 p.319.

584. op.cit. p.320.

585. SWS 13, 24.

586. Irmscher 17 p.289.

587. SWS 32, 337.

588. c.f. Adams 209 p.352.

589. c.f. Zöckler 243 II p.143.

590. SWS 13, 24.

591. SWS 18, 290.

592. SWS 13, 266.

593. SWS 13, 31.

594. SWS 13, 31-32.

595. Goethe 267 XII p.77, Versuch einer Witterungslehre 1825.

596. c.f. Caspar-Kepler 300 p.99.

597. SWS 4, 354.

598. Goethe 267 loc.cit.

599. I.A. Richter (ed.), Selections from the Notebooks of Leonardo da Vinci, London, O.U.P., 1952, p.45.

600. Caspar-Kepler 300 p.291.

601. see Science Journal, Vol. 1 No. 1, March, 1965, p.14, "Rainfall and the Moon".

602. SWS 30, 97, Schulrede, Von der Annehmlichkeit, Nützlichkeit und Nothwendigkeit der Geographie, probably 1784.

603. Bibl. Herd. 4 Nr. 3122-42, 3600, 3606-7, 3818, 3822, 3826, 3831, 3833, 4169-83, 4717, 4735 and appendix Nr. 214-215. See also appendix on atlases and maps.

604. SWS 30, 96 et seq.

605. SWS 30, 98.
606. SWS 30, 99.
607. SWS 30, 97.
608. SWS 30, 101.
609. SWS 30, 102.
610. Grundmann 84.
611. SWS 13, 44.

Part II, Chapter II.

1. Lebensbild 34 I pp.109-110.
2. Caroline 69 I p.35.
3. Bibl. Herd. 4 Nr. 3640-3647.
4. SWS 4, 351.
5. SWS 13, 60.
6. Dr.L.L. 95.
7. SWS 13, 430, Ideen Pt. II.
8. Rouché 170 p.198.
9. c.f. Masson 228 p.88.
10. c.f. Goodfield 221 p.35.
11. SWS 13, 267, Ideen Pt. II.
12. c.f. Nordenskiöld 230 pp.22 & 139.
13. c.f. Farrington 218 p.50.
14. Nordenskiöld 230 p.207.
15. c.f. Singer 236 p.29.
16. Baechtold 21 p.68.
17. SWS 13, 66-67.
18. Bärenbach 75 pp.30 & 38.
19. Schmidt=Cürtow 117 p.145.
20. Rouché 113 p.29.
21. SWS 15, 287.
22. SWS 19, 411, Christliche Schriften.
23. SWS 19, 414 & 422, op.cit.
24. SWS 21, 303, Metakritik.
25. Schulz und Basler, Deutsches Fremdwörterbuch, Berlin, 1942, article „Protoplasma".

26. loc.cit.
27. SWS 13, 81-82, esp. 82, below, early MS for „Ideen".
28. SWS 13, 276.
29. Clark 66 pp.218, 223 & 314.
30. c.f. Jammer 224 p.35.
31. c.f. Dessoir 216 I p.506; see SWS 4, 373, Journal, for Herder's knowledge of Hoffmann.
32. c.f. Huarte 282 p.30; see SWS 4, 458 for Herder's knowledge of Huarte's work, which Lessing had translated into German.
33. c.f. Düntzer 28 III p.96, Knebel to Herder, 12th July 1795.
34. c.f. Düntzer 26 I p.145, Goethe to Herder, 1793 or 1794.
35. c.f. Needham 310 p.XI and Needham 311 p.241.
36. We shall discuss Herder's knowledge of Blumenbach's work below.
37. c.f. SWS 13, 84, etc.
38. c.f. Driesch 217 pp.30-35.
39. Nordenskiöld 230 p.282.
40. Hansen 85 p.11.
41. Rüdiger 114 Blatt 2.
42. Goodfield 221 p.75.
43. op.cit. pp.108 & 158.
44. see note 98 below.
45. Varnhagen 58 II p.293, Herder to Knebel, 15th Dec. 1784 (date from the following work); Düntzer 28 III p.16, Knebel to Herder, 17th Dec. 1784.
46. c.f. Blumenbach 249 p.20; c.f. Driesch 217 p.59.
47. Blumenbach 249 pp.20-21.
48. Driesch 217 p.137.
49. op.cit. p.224.
50. Dessoir 216 I p.514.
51. Bertalanffy 189 p.43.
52. op.cit. p.45.
53. Bertalanffy 190 p.8.
54. c.f. Goodfield 221 pp.22-23.
55. Bertalanffy 189 p.44.
56. Schütze 173 XXI p.128.
57. Bertalanffy 190 p.171.

58. op.cit. p.180.
59. SWS 6, 26, Archäologie des Morgenlandes.
60. SWS 13, 101; also id., 13, 108; 13, 445; etc. c.f. SWS 8, 174, Vom Erkennen und Empfinden.
61. Lehwalder 98 p.110.
62. SWS 8, 174.
63. Wolff 320 II p.70.
64. Engels 193 p.320.
65. Whitehead 207 p.48.
66. Bertalanffy 189 p.47.
67. Herder's MSS S.P.K. D.S.T. Kapsel VIII Nr. 23-25.
68. Irmscher 17 p.292.
69. loc.cit.
70. SWS 8, 104.
71. loc.cit.
72. SWS 1, 246, editor's note; c.f. SWS 14, 663.
73. SWS 14, 680.
74. Wolff 320 II p.50.
75. op.cit. II p.60.
76. c.f. Driesch 217 p.101.
77. SWS 13, 173.
78. SWS 13, 171.
79. SWS 13, 274.
80. loc.cit.
81. SWS 14, 680.
82. SWS 12, 90, Vom Geist der ebräischen Poesie.
83. Needham 229 p.184.
84. SWS 2, 62.
85. SWS 5, 32.
86. SWS 31, 235.
87. SWS 7, 17.
88. SWS 8, 255.
89. SWS 13, 86.
90. SWS 13, 172.
91. SWS 13, 165-166.
92. Rouché 113 p.60.

93. Pamp 166 p.185 note.

94. SWS 13, 173.

95. SWS 14, 595.

96. Temkin 128 p.238; SWS 13, 273-274.

97. Wolff 320 II p.5.

98. The Catalogue of the British Museum Library lists this 1781 edition, presumably the one used by Herder in 1784. Nordenskiöld 230 (p.307 and bibliography) names only an edition of 1791, and Driesch 217 (p.58) names one of 1789.

99. c.f. SWS 14, 680, Suphan's remarks on editions of Wolff, and SWS 13, 273, on Harvey.

100. Clark 66 p.225.

101. SWS 13, 84; also id., 13, 94; 14, 273; 14, 274.

102. SWS 14, 680.

103. Haym 68 II p.205.

104. A. Hansen, Goethes „Metamorphose der Pflanzen", Gießen, 1907 p.228.

105. loc.cit.

106. op.cit. p.229.

107. SWS 14, 680.

108. Gillies 145 p.88.

109. Harich 88 p.57.

110. Varnhagen 58 II p.293; date is supplied by Düntzer 28 III p.16 note.

111. Düntzer 28 III p.16. Herder's subsequent reply shows that he has received the Latin edition.

112. Varnhagen 58 II p.297; date is supplied by Düntzer 28 III p.16.

113. Düntzer 28 III pp.16-17.

114. Varnhagen 58 II pp.267-268.

115. Düntzer 28 III p.17.

116. Haller 272 pp.191-202; c.f. pp.156-158. Herder used the Latin edition of 1766 (c.f. Haller 273).

117. c.f. Lovejoy 226 p.243.

118. c.f. Needham 229 p.188.

119. Clark 66 p.307.

120. Temkin 128 p.230 note.

121. Nordenskiöld 230 p.118.

122. SWS 13, 273.

123. Clark 66 p.306.

124. c.f. Baldwin 210 I p.79.
125. Zöckler 243 II p.235.
126. c.f. Driesch 217 p.39.
127. Kant 288 p.424.
128. Driesch 217 p.29.
129. Needham 229 p.187.
130. Driesch 217 p.39.
131. c.f. Needham 229 p.212.
132. op.cit. p.190.
133. c.f. Sauter 116 p.65.
134. SWS 7, 17, Älteste Urkunde.
135. Driesch 217 p.39.
136. c.f. SWS 13, 123.
137. SWS 13, 130.
138. loc.cit.
139. SWS 13, 123.
140. Düntzer 26 I p.121, Goethe to Herder, 4th May 1790.
141. SWS 13, 89.
142. SWS 13, 182.
143. SWS 13, 105.
144. c.f. Nordenskiöld 230 p.244.
145. c.f. Driesch 217 p.15.
146. Dessoir 216 I p.503.
147. Goethe 267 VIII p.239.
148. SWS 13, 275.
149. Temkin 128 p.239.
150. Wolff 320 II p.5.
151. Blumenbach 249 p.20.
152. Irmscher 17 p.289.
153. Haller 272 p.903.
154. Blumenbach 249 p.75.
155. c.f. Cumston 215 p.362.
156. Needham 311 p.317.
157. Irmscher 17 p.289.
158. SWS 13, 176.
159. SWS 13, 276.

160. loc.cit.
161. SWS 13, 171.
162. SWS 13, 142.
163. Siegel 176 p.237 note.
164. Rouché 170 p.218.
165. op.cit. p.220.
166. Kohlbrugge 93 p.1114.
167. Reimann 110 p.69.
168. Temkin 128 p.240.
169. op.cit. p.241.
170. SWS 4, 87, fourth „Kritisches Wäldchen".
171. Temkin 128 pp.242-243.
172. Needham 229 p.202.
173. op.cit. p.201.
174. White 238 I p.308.
175. c.f. Lovejoy 226 p.285.
176. Dobbek-Einsiedel 263 p.34.
177. Rouché 113.
178. Frazer 220 pp.3-34.
179. Adams 209 p.306.
180. Lovejoy 226 esp. p.54 et seq.; c.f. id., pp.80 & 183-184 on the main exponents of the doctrine.
181. Thienemann 237.
182. Willey 240 esp. pp.43-56.
183. SWS 13, 422.
184. Bibl. Herd. 4 Nr. 3591. "The origination of Mankind". Herder had the German translation of 1785.
185. c.f. Zöckler 243 I p.741.
186. Dobbek-Einsiedel 263 pp.19-21, introduction.
187. op.cit. p.232.
188. c.f. op.cit. p.19. Dobbek says it may date from either 1777 or 1799-1800.
189. SWS 13, 64.
190. loc.cit.
191. loc.cit.
192. SWS 13, 49.

193. SWS 23, 534.
194. c.f. Needham 229 p.184; also Driesch 217 p.39.
195. c.f. Nordenskiöld 230 p.170.
196. c.f. Zöckler 243 II p.237.
197. op.cit. I p.490.
198. Genesis Chapter 1 verse 24.
199. Needham 311 p.304; c.f. SWS 1, 246.
200. c.f. Needham 229 p.189.
201. c.f. Singer 236 p.286.
202. c.f. Nordenskiöld 230 p.323.
203. SWS 1, 246, Fragmente, 1767.
204. SWS 13, 65.
205. SWS 13, 96.
206. SWS 13, 423.
207. Rouché 113 p.30.
208. SWS 13, 23.
209. SWS 13, 48.
210. loc.cit.
211. loc.cit.
212. SWS 13, 398.
213. Sauter 116 p.19.
214. May 101 p.34.
215. SWS 13, 423.
216. e.g. SWS 13, 208.
217. SWS 13, 397.
218. c.f. Farrington 218 pp.44-45.
219. c.f. Nordenskiöld 230 p.328 note.
220. Pallas 312 pp.53-54.
221. Düntzer 28 III p.49, Knebel to Herder, 13th Feb. 1789.
222. SWS 13, 422.
223. SWS 6, 309.
224. SWS 7, 115.
225. SWS 13, 405.
226. SWS 13, 436-437.
227. c.f. Zöckler 243 II p.128.

228. SWS 5, 127.

229. SWS 5, 477, Auch eine Philosophie; c.f. SWS 8, 255, Vom Erkennen und Empfinden, 1774 version.

230. SWS 8, 255.

231. c.f. SWS 13, 405-406.

232. Nordenskiöld 230 p.309; c.f. Blumenbach 248 p.99.

233. c.f. Rouché 170 p.313; also Bruntsch 78 pp.35-36.

234. Nordenskiöld 230 p.210.

235. Günther 222 p.43.

236. Rouché 170 p.266.

237. Bruntsch 78 pp.36 & 81.

238. SWS 13, 397-398, Ideen.

239. Sauter 116 p.38.

240. SWS 13, 433.

241. SWS 4, 352.

242. SWS 30, 397.

243. SWS 11, 443-444.

244. SWS 13, 35; also id., 13, 63; 13, 215; 13, 402; 13, 406; 13, 410; 13, 432.

245. Herder's MSS S.P.K. D.S.T. Kapsel XXV Nr. 44 sheet 6, verso.

246. c.f. Zöckler 243 II p.186.

247. Pallas 312 p.32.

248. Zimmermann 321 I p.114.

249. SWS 30, 109.

250. SWS 14, 685.

251. SWS 13, 33.

252. SWS 13, 233.

253. Scott Keltie 234 p.31.

254. SWS 13, 479; c.f. the opening of „Auch eine Philosophie".

255. Siegel 176 p.158.

256. Thienemann 237 p.188.

257. SWS 4, 381.

258. SWS 4, 354.

259. Siegel 176 p.239, note to p.163.

260. SWS 13, 70; c.f. Siegel, loc.cit.

261. SWS 13, 135-136; c.f. Siegel, loc.cit.

262. Rouché 113 p.27.

263. SWS 16, 117 & 118, Tithon und Aurora.
264. SWS 13, 114.
265. SWS 13, 257.
266. SWS 13, 415.
267. Reimann 110 p.68.
268. Neumann 105 p.357.
268a. Harich 88 p.58.
269. Lovejoy 226 p.256.
270. Lovejoy 100 p.171 (reprint of Lovejoy 99).
271. op.cit. p.176.
272. Rouché 170 p.525.
273. Kohlbrugge 93 p.1113.
274. Clark 66 p.318.
275. Kant 292 p.54.
276. Lovejoy 100 p.172.
277. c.f. Nordenskiöld 230 p.214.
278. SWS 13, 403.
279. Lovejoy 100 p.172.
280. c.f. Wagner 61 p.237, editor's note; also Wagner 59 p.XXIX.
281. c.f. Günther 222 p.42.
282. Wagner 59 p.406.
283. Rouché 170 p.222 note.
284. Zimmermann 321 p.27.
285. Zöckler 243 II p.167.
286. Wagner 60 p.211, to Merck, 27th Oct. 1782.
287. Wagner 59 p.492, to Merck, 21st Oct. 1786.
288. Wagner 61 pp.238-239.
289. White 238 I p.229.
290. SWS 6, 113, Archäologie des Morgenlandes.
291. SWS 13, 472.
292. loc.cit.
293. SWS 13, 398.
294. SWS 13, 479.
295. SWS 13, 61.
296. e.g. SWS 13, 54; also id., 13, 60-61; 14, 250.
297. Kühnemann 70 p.326.

298. Lovejoy 100 p.173.
299. Götz 83 pp.396 & 399.
300. Schmidt=Cürtow 117 p.144.
301. Rouché 170 p.220.
302. Lucretius 307 II p.538.
303. Dobbek-Einsiedel 263 p.82.
304. op.cit. pp.76-77.
305. Rouché 170 p.231.
306. Willey 240 p.38.
307. Lovejoy 100 p.164.
308. Buffon 255b p.102.
309. Wells 133; see also Wells 132.
310. SWS 13, 70, Ideen.
311. Siegel 176 p.239, note to p.163.
312. loc.cit.
313. SWS 13, 56.
314. SWS 13, 63.
315. SWS 13, 254.
316. Siegel 176 p.165.
317. Rouché 170 p.217.
318. c.f. Nordenskiöld 230 pp.295-296.
319. op.cit. p.61.
320. Goethe 267 VIII p.18, Einleitung in die vergleichende Anatomie.
321. Götz 83 p.401.
322. Siegel 176 p.160.
323. SWS 13, 56; also id., 13, 63; 13, 282, etc.
324. c.f. Zöckler 243 I p.742.
325. c.f. SWS 13, 403.
326. Bruntsch 78 p.37.
327. loc.cit.
328. Rouché 170 p.219; c.f. also pp.224 & 271.
329. op.cit. p.271; c.f. Zimmermann 321 I p.23.
330. SWS 1, 88. Review of „Geschichte des menschlichen Verstandes".
331. SWS 13, 267-269.
332. Rouché 170 p.268.
333. Schwarz 121 p.152.

334. Steinborn 126 p.46.
335. Schwind 122 p.6.
336. Rouché 170 p.268.
337. Falconer 265.
338. Dobbek-Einsiedel 263 p.70.
339. SWS 13, 269 note.
340. Hippocrates 281 pp.1-2.
341. Herder's MSS S.P.K. D.S.T. Kapsel XXV Nr. 44 sheet 2.
342. SWS 4, 204-205, an older „Kritisches Wäldchen".
343. SWS 13, 211 & 296.
344. Gillies 147 pp.15 & 37.
345. Koller 94 XXIII pp.217-223.
346. Schütze 173 XIX p.361.
347. Rouché 170 p.23.
348. Bruntsch 78 p.61.
349. Regli 169 p.58.
350. Herder's MSS S.P.K. D.S.T. Kapsel XXV Nr. 44 sheet 1, verso.
351. Koller-Du Bos 262 p.67.
352. SWS 14, 684.
353. Hippocrates 281 p.35 etc.; c.f. SWS 13, 227.
354. Gillies 67 p.5.
355. Steinborn 126 p.74.
356. Clark 66 p.307.
357. Steinborn 126 pp.54-55.
358. Grundmann 84 p.35.
359. Zimmermann 321 I p.69.
360. c.f. Koller-Du Bos 262 pp.67 & 89.
361. SWS 1, 272, Fragmente.
362. SWS 13, 268.
363. Günther 222 p.64.
364. SWS 13, 269.
365. Rouché 170 p.268.
366. op.cit. p.223.
367. Siegel 176 p.165; c.f. SWS 13, 107.
368. SWS 5, 126.

369. SWS 13, 298.
370. SWS 13, 422.
371. SWS 4, 206, older „Kritisches Wäldchen"; c.f. SWS 4, 210.
372. SWS 10, 351, Theologische Briefe.
373. SWS 14, 671.
374. SWS 14, 112.
375. Siegel 176 p.165.
376. Rouché 170 p.217.
377. SWS 13, 278; Rouché 113 p.64.
378. SWS 13, 218.
379. SWS 13, 282.
380. Siegel 176 p.162.
381. SWS 13, 284.
382. Russell 232 p.72.
383. Hippocrates 281 p.23.
384. Kant 284 p.97.
385. Blumenbach 248 p.121.
386. Camper 257 p.17.
387. Clark 66 p.34.
388. Rouché 170 p.270.
389. SWS 13, 228, Ideen.
390. Hippocrates 281 p.20.
391. May 102 p.224.
392. SWS 13, 234.
393. SWS 13, 216.
394. SWS 13, 258, Ideen.
395. SWS 18, 248.
396. loc.cit.
397. SWS 1, 48.
398. Günther 222 p.36.
399. Rasch 73 is guilty of such distortions.
400. Rouché 170 p.248.
401. op.cit. p.276.
402. c.f. Bruntsch 78 pp.44-45.
403. SWS 18, 248.
404. c.f. Kant 291 pp.311-320 for Kant's interest in race in his lectures.

405. Blumenbach 248 p.121.
406. Camper 259 p.38. Camper also refers to Buffon here.
407. Pallas 312 p.54.
408. Blumenbach 248 p.113.
409. c.f. Bruntsch 78 p.46.
410. c.f. Düntzer 26 II p.384, editor's note.
411. c.f. Günther 222 p.50.
412. c.f. SWS 32, 21-22, Von der Verschiedenheit des Geschmacks und der Denkart etc.
413. c.f. SWS 13, 233, Ideen.
414. c.f. Günther 222 p.51 on Haller's ideas.
415. SWS 13, 234.
416. Günther 222 p.52.
417. Camper 259 p.40.
418. SWS 32, 355.
419. Irmscher 17 p.288.
420. SWS 31, 216.
421. SWS 29, 441.
422. SWS 13, 194.
423. SWS 13, 197.
424. SWS 13, 198.
425. SWS 13, 194.
426. SWS 13, 197.
427. SWS 16, 541.
428. Leo Tolstoy, War and Peace, transl. L. & A. Maude, London, O.U.P., 1941, Vol. 1 p.515.
429. SWS 13, 167.
430. Lovejoy 226 pp.248 & 283.
431. Kronenberg 158 p.66.
432. Kühnemann 71 p.194.
433. SWS 13, 177.
434. Haym 68 II pp.211-212.
435. op.cit. I pp.295-296.
436. c.f. Unger 57, and Unger 183.
437. Pamp 166.
438. Unger 57 p.19.
439. SWS 13, 180.

440. SWS 13, 198.
441. Kant 292 p.53; c.f. Haym 68 II p.247.
442. Kant 283 p.367.
443. Rouché 170 p.219.
444. Unger 183 p.271.
445. SWS 15, 295.
446. SWS 16, 350, Zerstreute Blätter.
447. SWS 14, 665.
448. Haym 68 II p.205, to Knebel, 1st May 1784.
449. SWS 13, 447.
450. Rouché 170 pp.210-211.
451. Irmscher 17 p.289.
452. op.cit. p.290.
453. Unger 57 p.152 et seq.
454. SWS 15, 303.
455. SWS 16, 352.
456. Unger 183 p.259.
457. SWS 13, 178.
458. loc.cit.
459. SWS 15, 291.
460. SWS 9, 537, Über die dem Menschen angeborne Lüge.
461. SWS 8, 175, Vom Erkennen und Empfinden.
462. Rouché 170 p.222.
463. Siegel 176 p.164.
464. c.f. Willey 240 pp.52-53.
465. Irmscher 17 pp.288-289.
466. SWS 14, 499.
467. SWS 31, 396.
468. Faust Pt. II, lines 9981-9982.
469. SWS 16, 366, Zerstreute Blätter.
470. Needham 311 p.352.
471. Unger 183 p.261.
472. Herder's MSS N.F.G. (G.S.A.), Anfangsgründe der Sternkunde p.32.
473. SWS 13, 17.
474. SWS 13, 19.

475. SWS 21, 287.
476. SWS 23, 526.
477. loc.cit.
478. SWS 23, 534.
479. Herder'd MSS N.F.G. (G.S.A.), Anfangsgründe der Sternkunde p.23.
480. SWS 13, 20.
481. SWS 15, 272.
482. SWS 15, 276.
483. SWS 31, 512.
484. SWS 29, 559.
485. Kant 283 p.329.
486. Düntzer 26 II pp.24-25, to Lavater, 30th Oct. 1772.
487. Siegel 176 p.143.
488. Rouché 170 p.204.
489. c.f. Clerke 214 p.68.
490. c.f. Macgillivray 227 p.176.
491. c.f. Lovejoy 226 p.109.
492. op.cit. p.116.
493. c.f. SWS 23, 573.
494. c.f. Lovejoy 226 p.138.
495. op.cit. p.255.
496. c.f. Zöckler 243 II p.59.
497. c.f. op.cit. II p.62.

Part II, Chapter III.

1. SWS 5, 95, language essay; c.f. SWS 13, 369, Ideen.
2. SWS 5, 99, language essay.
3. SWS 5, 100, op.cit.
4. SWS 5, 112 & 114, op.cit.
5. c.f. E. Castle, „Pater Brey" und „Satyros", Jahrbuch der Goethe= Gesellschaft Bd. 5, Weimar 1918, p.89. We are indebted to Unger 57 p.159 for drawing attention to this article.
6. Lovejoy 226 pp.233-234.
7. c.f. Günther 222 p.30; also Lovejoy 226 pp.233-236.
8. SWS 5, 42; also id., 13, 111-112; 7, 80.
9. SWS 32, 21, Von der Verschiedenheit des Geschmacks und der Denkart etc.

10. loc.cit.
11. c.f. E. Castle, op.cit. pp.87-89.
12. c.f. SWS 14, 661 and Macgillivray 227 p.274.
13. c.f. Rouché 170 p.222.
14. c.f. Lovejoy 226 p.196; also Lisch 45 p.272 for evidence that Herder received Bolingbroke's works as a present from the astronomer von Hahn.
15. c.f. SWS 32, 21.
16. c.f. Lovejoy 100 pp.177-178.
17. Kant 291 pp.315-316.
18. c.f. Lovejoy 226 p.271.
19. Blumenbach 248 p.141; c.f. Günther 222 p.34.
20. Camper 259 p.33; c.f. SWS 15, 186.
21. SWS 13, 115 & 118; also SWS 15, 185.
22. Tyson 319.
23. op.cit. p.55.
24. SWS 13, 122.
25. c.f. SWS 13, 111; also id., 13, 117; 13, 129; 13, 131; 13, 146; 13, 151; etc.
26. Sauter 116 p.34.
27. SWS 7, 74 and SWS 13, 137; c.f. Siegel 176 p.68.
28. Zimmermann 321 I pp.124-129.
29. c.f. Lovejoy 100 p.175.
30. SWS 7, 74.
31. Kant 293.
32. Rouché 170 p.206.
33. Blumenbach 248 pp.84-85.
34. Kant 292 p.53.
35. Hettner 35 pp.222-223, 19th May 1785.
36. Hansen 87, no pagination.
37. Rouché 170 p.206.
38. W.E.H. Lecky, History of the Rise and Influence of Rationalism in Europe, 2nd edn., London, 1865, Vol. I p.389.
39. SWS 13, 134-135; c.f. Camper 257 pp.15-16.
40. Rouché 170 p.206.
41. c.f. Haddon 223 pp.31-32.
42. loc.cit.

43. c.f. Caroline 69 I p.35.
44. c.f. Düntzer 26 II p.325 et seq.
45. SWS 4, 373, Journal.
46. SWS 4, 443, Journal.
47. loc.cit.
48. SWS 13, 267.
49. c.f. Hoffmann 37 p.67, Herder to Hamann, 1st August 1772.
50. Caroline 69 III p.223.
51. c.f. SWS 14, 681, Suphan's comments.
52. Herder's MSS S.P.K. D.S.T. Kapsel XXVIII Nr. 6.
53. Bibl. Herd. 4 Nr. 3406 & appendix, Nr. 104.
54. Lehwalder 98.
55. op.cit. pp.6-35.
56. op.cit., e.g. p.153.
57. Richter 111.
58. Probst 108.
59. Götz 82.
60. Schütze 119.
61. Clark 66 esp. pp.217-233.
62. c.f. SWS 4, 56, fourth „Kritisches Wäldchen".
63. Götz 82 p.13.
64. SWS 4, 383.
65. Baldwin 210 I p.30.
66. SWS 4, 105, fourth „Kritisches Wäldchen"; c.f. SWS 13, 176, Ideen.
67. SWS 1, 394, Fragmente.
68. SWS 8, 239.
69. Probst 108 pp.54-55.
70. Strothmann 180 p.183.
71. Rouché 170 pp.194-195 & p.197.
72. c.f. Willey 240 p.142.
73. c.f. Nordenskiöld 230 p.270.
74. Probst 108 pp.60-61.
75. SWS 4, 105.
76. SWS 4, 458.
77. SWS 15, 231, Zerstreute Blätter.

78. SWS 8, 266, Vom Erkennen etc., 1775 version.
79. SWS 8, 42.
80. SWS 13, 83.
81. SWS 13, 124.
82. SWS 13, 125.
83. Hartley 276 I p.7.
84. SWS 13, 123.
85. SWS 13, 83.
86. Lebensbild 34 II p.271, to Scheffner, 15th-26th Sep. 1767.
87. SWS 14, 661-662.
88. Huarte 282 p.54.
89. c.f. Dessoir 216 I p.480.
90. Kant 294 p.345.
91. c.f. H. Hallam, Introduction to the Literature of Europe in the 15th, 16th & 17th Centuries, London, 1837-1839, Vol. I p.639 and note.
92. Clark 66 p.224.
93. loc.cit.
94. SWS 13, 81-82, Ideen.
95. c.f. his rejection of Descartes' pineal gland theory in 1775 as „mechanisch" (SWS 8, 266).
96. SWS 13, 125.
97. SWS 13, 182.
98. Götz 82 p.72.
99. c.f. Nordenskiöld 230 p.237.
100. SWS 13, 123, Ideen.
101. Nordenskiöld 230 p.149.
102. SWS 23, 583, Adrastea.
103. Nordenskiöld 230 p.311.
104. op.cit. pp.161 & 187.
105. c.f. I.P. Pavlov, Conditioned Reflexes, An Investigation of the Physiological Activity of the Cerebral Cortex, new edn., Dover, New York, 1960 (first publ. 1927), pp. 2 & 219 et seq.
106. SWS 4, 38.
107. SWS 4, 458.
108. SWS 13, 186.
109. SWS 13, 344.
110. Huarte 282 p.62; c.f. id., p.78.

111. Richter 111 p.25.
112. SWS 13, 83.
113. SWS 13, 120-121.
114. Günther 222 p.38.
115. SWS 13, 122.
116. SWS 13, 121 note.
117. SWS 8, 42.
118. SWS 9, 455 & 458, etc.
119. Caroline 69 III p.195.
120. SWS 32, 23, Von der Verschiedenheit des Geschmacks und der Denkart etc.
121. SWS 13, 73.
122. SWS 13, 77.
123. SWS 13, 130.
124. SWS 13, 180.
125. SWS 13, 182.
126. c.f. Günther 222 p.78.
127. Singer 236 p.278.
128. Nordenskiöld 230 pp.161 & 178.
129. op.cit. p.186.
130. Haller 273 p.195.
131. Haller 274 p.202.
132. Nordenskiöld 230 p.310.
133. op.cit. p.323.
134. Varnhagen 58 III p.293, undated essay.
135. c.f. Günther 222 p.75.
136. c.f. H. Hallam, Introduction to the Literature of Europe in the 15th, 16th & 17th Centuries, London, 1837-1839, Vol. IV p.70 note on Croll, and Dessoir 216 I p.506 on Hoffmann.
137. c.f. Cumston 215 pp.339-340.
138. Bertrand 212 pp.8-20.
139. SWS 8, 99 early sketches for „Plastik", c. 1769.
140. SWS 15, 167.
141. c.f. Bertrand 212 p.34.
142. Gelzer 31 p.114, Herder to J.G. Müller, Dec. 1785.
143. SWS 11, 205, Theologische Briefe.
144. c.f. Zöckler 243 II p.81.

145. Kant 294 p.371.
146. Brugmans 253, Eschenbach's preface.
147. see Jeans 225 pp.279-280.
148. Varnhagen 58 II p.295, to Knebel, 18th May 1793.
149. SWS 22, 331, Kalligone; SWS 23, 482, Adrastea.
150. see Schauer 52 p.37, to Caroline, 4th Sep. 1803.
151. Caroline 69 III pp.108 & 194.
152. c.f. Stapf 54 p.86, Caroline to Jean Paul, 20th April 1801.
153. Düntzer 26 II p.452, to August, 1800.
154. SWS 4, 103, fourth „Kritisches Wäldchen"; c.f. Burke 256 pp.134 & 149-150.
155. SWS 13, 268.
156. SWS 8, 186.
157. SWS 8, 173.
158. SWS 8, 185.
159. SWS 13, 267.
160. Lehwalder 98 p.66.
161. Dessoir 216 I p.516.
162. c.f. Haller 273 p.194.
163. SWS 1, 489, Fragmente.
164. SWS 4, 104, fourth „Kritisches Wäldchen".
165. SWS 8, 191.
166. SWS 13, 156.
167. SWS 24, 439.
168. Haller 273 p.195.
169. c.f. Willey 240 p.141.
170. c.f. Günther 222 p.78.
171. c.f. Willey 240 p.138.
172. c.f. Dessoir 216 I p.516.
173. loc.cit.
174. op.cit. I pp.217 & 219.
175. SWS 5, 310.
176. quoted by Günther 222 p.60.
177. see Hoffmann 37 p.67, to Hamann, 1st August 1772.
178. SWS 8, 250.
179. SWS 13, 276.
180. SWS 13, 281.

181. loc.cit.

182. Herder's MSS S.P.K. D.S.T. Kapsel XXVIII Nr. 6 contains extracts from Prochaska's "De structura nervorum".

183. c.f. SWS 14, 680, Suphan's notes.

184. Clark 66 p.58.

185. op.cit. p.207 etc.

186. op.cit. p.218.

187. op.cit. p.223.

188. SWS 8, 106.

189. Düntzer 26 II pp.19-20, to Lavater, 30th Oct. 1772.

190. Wagner 60 p.35, to Merck, Sep. 1771.

191. Schütze 119 p.531.

192. Wagner 60 loc.cit.

193. Haller 273 pp.194-195.

194. Haller 274 p.201.

195. Götz 82 p.42.

196. SWS 8, 169 et seq. and SWS 13, 81-82.

197. SWS 13, 78, Ideen.

198. Lehwalder 98 pp.48-49.

199. op.cit. p.62.

200. op.cit. p.72.

201. op.cit. p.101.

202. Clark 66 p.223.

203. c.f. Needham 229 p.23.

204. c.f. Berger 137 p.314 and Rouché 170 p.203 on Glisson as a precursor of Haller.

205. c.f. Clark loc.cit.

206. SWS 8, 169.

207. SWS 13, 81-82.

208. SWS 8, 172, Vom Erkennen etc., 1778.

209. c.f. Macgillivray 227 p.56.

210. Huarte 282 p.32 et seq.

211. Clark 79 p.745.

212. Lehwalder 98 p.82.

213. SWS 8, 196; c.f. SWS 13, 82.

214. Clark 66 p.225.

215. op.cit. p.226.

216. G. Rattray Taylor, The Science of Life, London, 1963, p.347.

217. Schütze 119 pp.537 & 548.

218. Schütze 173 XIX p.114.

219. c.f. Needham's remark in Needham 229 p.40.

220. Schütze 173 XXI p.130.

221. R.A. Hinde, Energy Models of Motivation, in Models and Analogues 198 p.210.

222. op.cit. p.211.

223. loc.cit.

224. op.cit. pp.211-212.

225. SWS 7, 13.

226. Clark 79 p.742.

227. loc.cit.; c.f. Clark 66 p.223.

228. c.f. Jammer 224 p.35.

229. Needham 229 p.216.

230. Cumston 215 p.242.

231. c.f. SWS 2, 174, Fragmente; also SWS 8, 171, Vom Erkennen etc.

232. SWS 5, 29.

233. SWS 1, 418, Fragmente, 1767.

234. Clark 66 p.220.

235. SWS 1, 525.

236. c.f. SWS 4, 11.

237. SWS 4, 33, etc.

238. Haym 68 I p.178.

239. e.g. SWS 5, 31, language essay, 1770; SWS 7, 262, Provinzial=Blätter, 1774; SWS 8, 196, Vom Erkennen etc., 1778; SWS 9, 295, Vom Einfluß der schönen in die höheren Wissenschaften.

240. SWS 13, 345.

241. SWS 32, 73, Fragmente einer Abhandlung über die Ode. Suphan, in an editorial note, points out that Burke, in Hartknoch's translation of his work on the Sublime and the Beautiful, speaks of „die Logik des Geschmacks".

242. SWS 1, 524-525, Fragmente.

243. SWS 4, 10 (1769).

244. SWS 5, 185.

245. SWS 5, 95 & 100, etc.

246. c.f. Farrington 218 p.153.
247. SWS 5, 60-61.
248. Lehwalder 98 pp.112-118.
249. SWS 21, 83.
250. Münz 103.
251. Varnhagen 58 III p.214, Beiträge zur Intelligenz, 1788.
252. Nordenskiöld 230 p.310.
253. Baldwin 210 I pp.64-65.
254. Kühnemann 71 p.181.
255. SWS 4, 361.
256. e.g. SWS 4, 381; also id., 4, 448-450; 13, 307-308; 21, 245; 30, 510, etc.
257. Baldwin 210 II p.2.
258. SWS 8, 226, Vom Erkennen etc.
259. Clark 66 pp.161 & 399.
260. op.cit. p.222.
261. loc.cit.
262. Dessoir 216 I p.212.
263. Engels 193 p.331.
264. R.A. Hinde, p.211 (see note 221 above).
265. Schütze 119 p.522.
266. Götz 82 pp.31-32.
267. SWS 21, 41.
268. Clark 66 pp.204 & 315.
269. op.cit. p.315.
270. SWS 13, 183.
271. Clark 66 p.204.
272. Hartley 276 I p.72.
273. SWS 13, 184.
274. SWS 13, 188.
275. SWS 4, 36; c.f. SWS 4, 38.
276. SWS 31, 183.
277. SWS 13, 345.
278. Götz 82 p.82.
279. Clark 66 p.204.
280. to Merck, 1772 (see Wagner 59).

281. SWS 14, 603; c.f. SWS 2, 258.
282. Siegel 176 p.52.
283. Lebensbild 34 II pp.10-16, Hamann to Herder, 21. Jan. 1765.
284. SWS 13, 330.
285. SWS 23, 289, Adrastea; c.f. id., 22, 119; 31, 272.
286. SWS 13, 182.
287. SWS 15, 521 et seq.
288. SWS 7, 320, earlier version of „Johannes".
289. Probst 108 p.8.
290. Schütze 119 p.554.
291. Clark 66 p.231; c.f. Clark 141.
292. Clark 66 pp.230-231.
293. SWS 8, 233.
294. Bruford 140 p.222.
295. SWS 4, 466.
296. Clark 66 pp.228-229.
297. SWS 5, 181.
298. Grundmann 84 p.111.
299. Kant 291 p.164.
300. c.f. Haym 68 I pp.71-75.
301. Bibl. Herd. 4 Nr. 3705, 3706, 3708-9, 3732-3748, 3852, 5777, 5780-2, 7011-13 and appendix Nr. 138.
302. SWS 4, 410.
303. Rouché 170 p.67.
304. SWS 14, 448-456.
305. SWS 14, 456.
306. Clark 66 p.329.
307. SWS 14, 219.
308. loc.cit.

Part III, Chapter I.

1. SWS 9, 300-301.
2. SWS 11, 91, Theologische Briefe; c.f. SWS 4, 383, Journal.
3. SWS 2, 357, Über Thomas Abbts Schriften.
4. Caroline 69 I p.63, Kurella to Puttlich, 2. April 1805.

5. SWS 1, 5, Über den Fleiß in mehreren gelehrten Sprachen, 1764.
6. c.f. SWS 1, 474-476 and editor's note.
7. SWS 1, 363, Fragmente.
8. SWS 4, 353, Journal.
9. SWS 4, 368.
10. Caroline 69 III p.249 quotes this passage from Jean Paul's „Vorschule der Aesthetik", 1804.
11. Herder's MSS S.P.K. D.S.T. Kapsel XXV Nr. 45-46 and N.F.G. (G.S.A.), Anfangsgründe der Sternkunde.
12. Bibl. Herd. 4 Nr. 3334 and 5721.
13. op.cit. Nr. 3156.
14. op.cit. Nr. 58-60, appendix.
15. op.cit. Nr. 56-57, appendix.
16. op.cit. Nr. 44, appendix.
17. op.cit. Nr. 52-55, appendix.
18. e.g. op.cit. Nr. 1640-41, 1648-49, 1767, 1799, 1868, 1877, 1977-79, 2040, 2049, 2080, 2093, 2243-45, 2252, 3272, 105 (appendix) and 151-155 (appendix).
19. e.g. SWS 20, 60, Christliche Schriften; c.f. the "hieroglyph" of the „Älteste Urkunde".
20. SWS 14, 129.
21. loc.cit.
22. SWS 9, 505.
23. SWS 14, 420, Ideen.
24. SWS 30, 53, Schulrede, 1780.
25. SWS 14, 443-444; 14, 482; 14, 552-553; c.f. also SWS 9, 340.
26. SWS 14, 482.
27. SWS 30, 402.
28. SWS 14, 36.
29. Goethe 267 I p.XV.
30. SWS 4, 443 & 445.
31. SWS 9, 348, Vom Einfluß der Regierung auf die Wissenschaften, 1780.
32. SWS 14, 491, Ideen.
33. SWS 14, 633-634.
34. Rouché 170 p.66.
35. Pascal 167 p.39.
36. SWS 8, 472.
37. SWS 13, 368.

38. Herder's MSS N.F.G. (G.S.A.), Anfangsgründe der Sternkunde, p.10.
39. Rouché 170 p.66 note.
40. Schwedische Abhandlungen 244 IX p.90.
41. SWS 14, 633 ref. „magnetische Abweichung".
42. Goethe 267 XI p.255, Erfinden und Entdecken.
43. Rouché 170 p.532.
44. SWS 13, 369.
45. SWS 13, 374.
46. Birkner 138 pp.100-101; c.f. Haym 68 I p.548 and Rouché 170 pp.65-66.
47. SWS 5, 534.
48. SWS 9, 406.
49. SWS 13, 372-374 and 13, 370.
50. SWS 14, 490.
51. SWS 14, 241-243.
52. Birkner 138 p.100.
53. op.cit. pp.104-105 etc.
54. SWS 5, 533, Auch eine Philosophie; c.f. SWS 14, 490, Ideen.
55. SWS 5, 568.
56. c.f. Bacon's "De Augmentis", Bk. II Chap. 2; c.f. also Farrington-Bacon 246 p.95.
57. SWS 13, 314, Ideen.
58. SWS 13, 317.
59. SWS 18, 280, Humanitäts=Briefe.
60. Pascal 167 p.38.
61. c.f. Bacon's "Novum Organum", Aphorism 129; also Farrington-Bacon 246 p.6.
62. SWS 14, 240.
63. SWS 5, 546.
64. SWS 14, 221-222.
65. SWS 17, 118, Humanitäts=Briefe.
66. Dobbek, in Einsiedel 263 p.37; c.f. also op.cit. p.176.
67. SWS 24, 341, Adrastea.
68. Bärenbach 75; also Hansen 87.
69. SWS 4, 351.
70. Gillies 16 p.127.

71. Kant 286 p.5.

72. Sarton 233 p.10.

73. c.f. Haym 68 I p.82; also Bürkner 65 p.26.

74. c.f. Herder's unpublished MSS on mathematics, already mentioned, and N.F.G. (G.S.A.) Anfangsgründe der Sternkunde.

75. c.f. Bojanowski 22 p.427, Herder to the Großherzogin Luise, 13. Dec. 1797.

76. c.f. also Andress 134 Chapter XV.

77. Caroline 69 III p.21.

78. SWS 4, 373, Journal.

79. op.cit. p.377.

80. op.cit. p.381.

81. op.cit. p.373.

82. op.cit. p.381.

83. loc.cit.

84. loc.cit.

85. op.cit. p.377

86. loc.cit.

87. op.cit. p.373.

88. SWS 4, 377.

88a. c.f. Reisiger 74, family-tree at end of volume.

89. SWS 30, 16, Von der Grazie in der Schule.

90. Buffon 255a p.8.

91. Kant 289 p.312.

92. c.f. SWS 9, 301, Über den Einfluß der schönen in die höheren Wissenschaften, 1781.

93. SWS 4, 372.

94. SWS 4, 373.

95. SWS 4, 374.

96. SWS 4, 376.

97. SWS 4, 377-378.

98. SWS 4, 378.

99. SWS 4, 381.

100. SWS 4, 382.

101. SWS 4, 383.

102. SWS 4, 385.

103. SWS 5, 652, Ursachen des gesunkenen Geschmacks.
104. Günther 222 p.40.
105. SWS 11, 83, Theologische Briefe.
106. c.f. SWS 4, 370, Journal.
107. SWS 32, 254.
108. SWS 31, 112.
109. loc.cit.
110. SWS 31, 120.
111. loc.cit.
112. SWS 32, 210.
113. SWS 9, 91, Johannes, 1774 version.
114. SWS 10, 203.
115. SWS 12, 296.
116. SWS 13, 62.
117. SWS 13, 457.
118. SWS 20, 52, Christliche Schriften.
119. SWS 20, 131 ibid.
120. SWS 4, 360.
121. SWS 7, 185, Provinzial=Blätter.
122. SWS 7, 470.
123. SWS 10, 164.
124. SWS 11, 446.
125. SWS 12, 44.
126. SWS 12, 66.
127. SWS 12, 312.
128. Haym 68 II p.225.
129. SWS 13, 198.
130. SWS 16, 389, Zerstreute Blätter, 1797.
131. SWS 19, 33, Christliche Schriften.
132. c.f. Zöckler 243 II p.71.
133. Hartley 276 II p.149.
134. Zöckler 243 II p.72.
135. W.E.H. Lecky, History of the Rise and Influence of Rationalism in Europe, 2nd edn., London, 1865, Vol. 2 p.61.
136. Bruford 140 p.187.
137. op.cit. p.188.
138. SWS 23, 10, Aurora; c.f. SWS 23, 471; 31, 562; 31, 605.

139. SWS 20, 191, Christliche Schriften.
140. SWS 7, 250, Provinzial=Blätter.
141. SWS 4, 381.
142. Bertrand Russell, The Wisdom of the West, London, 1959, p.21.
143. SWS 6, 86-87 (1769).
144. SWS 6, 106.
145. c.f. SWS 6, 31, Archäologie des Morgenlandes, 1769.
146. SWS 6, 32.
147. Haym 68 I p.705.
148. e.g. SWS 7, 9 and 7, 17.
149. SWS 7, 114.
150. SWS 10, 329.
151. SWS 10, 330.
152. quoted by Zöckler 243 II p.117.
153. Suphan 181 p.69.
154. Rouché 170 p.533.
155. Sell 175 p.95.
156. Clark 66 p.213.
157. Lindner 162 pp.67 and 195.
158. c.f. J.B. Bury, A History of the Freedom of Thought, O.U.P., London, 1913, reprinted 1942, p.113.
158a. Carl L. Becker, The Heavenly City of the Eighteenth Century Philosophers, New Haven, 1932.
158b. op.cit. p.69.
159. Rouché 170 p.266.
160. E.C. Mason, Exzentrische Bahnen; Studien zum Dichterbewußtsein der Neuzeit, Göttingen, 1963, p.52.
161. Zöckler 243 II p.39.
162. Clark 66 p.393.
163. SWS 14, 483.
164. Rouché 170 p.249.
165. SWS 9, 130.
166. Russell 232 p.179.
167. op.cit. p.185.
168. Koch 157 p.18.
169. SWS 9, 423, review of Lavater's „Physiognomische Fragmente", 1776.

170. Kühnemann 70 p.228.
171. Lovejoy 226 p.126.
172. SWS 29, 110. This is the title of a poem written in Bückeburg.
173. SWS 9, 537; c.f. SWS 23, 534.
174. Pamp 166 p.34.
175. SWS 13, 20.
176. SWS 13, 25.
177. A.N. Whitehead, An Introduction to Mathematics, London, 1911, 9th impression, 1939, p.12.
178. Caspar-Kepler 300 p.278.
179. Bode 250 p.XVIII, preface; see also ibid. p.393 for vignette.
180. SWS 13, 20.
181. SWS 24, 57, Adrastea.
182. SWS 15, 278, Gespräche über die Seelenwanderung.
183. SWS 24, 574.
184. Popper 202 p.78.
185. Siegel 235 p.131.
186. SWS 5, 377.
187. SWS 30, 80, Schulrede, prob. 1782.
188. SWS 14, 597, Ideen.
189. SWS 1, 116, review of a work by Dusch.
190. e.g. SWS 5, 461 (1772) and 23, 482 (1802).
191. SWS 6, 268, Älteste Urkunde; c.f. SWS 7, 11, note.
192. SWS 7, 17.
193. Hamann 33 II p.17, quoted by Berger 136 p.56.
194. SWS 9, 506.
195. SWS 9, 507.
196. SWS 22, 199, Kalligone.
197. SWS 22, 218, ibid.
198. SWS 23, 54.
199. SWS 23, 245.
200. SWS 15, 533.
201. Goethe 267 VI p.139, Schicksal der Druckschrift.
202. SWS 15, 534-535.
203. Pamp 166 p.182 note.
204. SWS 24, 575.

205. Caspar-Kepler 300 p.389.

206. c.f. Jeans 225 p.60.

207. SWS 23, 527.

208. e.g. SWS 22, 78.

209. c.f. Dobbek 143.

210. Siegel 176 p.203.

211. c.f. Nordenskiöld 230 p.90.

212. c.f. Forbes 219 p.40.

213. c.f. Lovejoy 226 p.105 (note 11 on p.345).

214. e.g. SWS 13, 25.

215. Galileo 266 p.263, Il Saggiatore.

216. SWS 8, 171, Vom Erkennen etc.

217. SWS 8, 180, op.cit.

217a. SWS 5, 168.

217b. Götz 82 p.33.

217c. H.T. Buckle, History of Civilisation in England, 2nd edn., London, 1858 (first publ. 1857), Vol. 1 p.22 note 22.

218. c.f. SWS 13, 477, Ideen.

219. c.f. Willey 240 p.28.

220. Haym 68 II p.785.

221. Gillies 67 p.82.

222. Kühnemann 71 p.167; c.f. op.cit. p.172 for some exaggeration.

223. Russell 232 p.29.

224. SWS 8, 99, Plastik, 1769 version.

225. SWS 4, 89.

226. Haym 68 I p.162.

227. c.f. SWS 3, 260, Kritische Wälder, 1768.

228. SWS 3, 262.

229. SWS 3, 261-262.

230. SWS 5, 295, review of Creuz's poems.

231. SWS 5, 320, review of Sucro's works, 1773; c.f. SWS 5, 390, review of Sulzer, 1774.

232. SWS 11, 293, Vom Geist der ebräischen Poesie.

233. translated Leipzig, 1779.

234. SWS 12, 10, Vom Geist der ebräischen Poesie; c.f. SWS 15, 546 & 18, 99.

235. SWS 17, 222, Humanitäts=Briefe.

236. SWS 17, 223.

237. SWS 22, 331-332.

238. SWS 22, 332, editor's note.

239. SWS 23, 244.

240. SWS 24, 299, Adrastea.

241. Goethe 267 III p.120, Farbenlehre, Historischer Theil.

242. Haym 68 I p.162.

243. SWS 5, 390, review of Sulzer, 1774.

244. c.f. Nordenskiöld 230 p.49.

245. Düntzer 26 II p.20 and editor's note.

246. Düntzer 28 I p.251, to Gleim, 18. Jan. 1799.

247. Varnhagen 58 II p.279, to Knebel, 6. May 1799.

248. C.P. Snow, The Two Cultures and the Scientific Revolution, Rede Lecture, Cambridge, 1959, p.16.

249. SWS 3, 137, Kritische Wälder.

250. SWS 18, 85, Humanitäts=Briefe, 1794.

251. Clark 66 p.372.

252. SWS 9, 295, Über den Einfluß der schönen in die höheren Wissenschaften.

253. loc.cit.

254. Goethe 267 VIII p.222, Tibia und Fibula, 1824.

255. SWS 23, 244, Adrastea, 1801.

256. Caroline 69 III p.109.

257. Herder's MSS S.P.K. D.S.T. Kapsel XXVIII Nr. 13; c.f. Bode's Astronomisches Jahrbuch auf das Jahr 1788, p.208, for original article.

258. ditto Kapsel XXVIII Nr. 1 p.47, recto and verso; c.f. Phil. Trans. Vol. 74, 1784, Pt. II, p.233 et seq. and p.437 et seq.

259. SWS 13, 58.

260. SWS 13, 267.

261. Caroline 69 III p.195.

262. SWS 17, 218, Humanitäts=Briefe.

263. SWS 16, 557.

264. Einsiedel 263 pp.147 and 156.

265. c.f. SWS 27, 398 et seq., for his translation of Shaftesbury's „Naturhymnus".

266. SWS 28, 333.

267. SWS 22, 245, Kalligone, 1800.

268. Haym 68 II p.121.
269. SWS 9, 351, Über den Einfluß der schönen in die höheren Wissenschaften.
270. SWS 31, 88.
271. SWS 13, 148; c.f. SWS 22, 233, Kalligone, 1800.
272. SWS 22, 88, Kalligone, 1800.
273. SWS 22, 314, op.cit.
274. Rouché 170 p.193.
275. Schwind 122 p.6.
276. SWS 22, 128, Kalligone, 1800.
277. SWS 29, 209.
278. SWS 17, 343, Humanitäts=Briefe.
279. Varnhagen 58 III p.226.
280. SWS 18, 341.
281. SWS 23, 247, Adrastea.
282. SWS 23, 259, op.cit.
283. SWS 23, 252, op.cit.
284. SWS 26, 312.
285. SWS 23, 252.
286. SWS 23, 310.
287. SWS 17, 119, Humanitäts=Briefe.
288. Goethe 267 XII p.102, Versuch einer Witterungslehre, 1825.
289. SWS 23, 251.
290. Farrington-Bacon 246 p.45.
291. SWS 13, 316.
292. SWS 28, 339.
293. Goethe 267 VIII p.236.
294. Zimmermann 321 I p.23.
295. SWS 16, 557.
296. SWS 16, 560, Gott.
297. Goethe 32 XLIX p.211, to Wackenroder, 21. Jan. 1832.
298. SWS 31, 489, sermon.
299. SWS 31, 483, sermon.

Part III, Chapter II.

1. c.f. Düntzer 28 II p.331, to Caroline, Gotha, 30. Sep. 1789.
2. c.f. Haym 68 II p.809.
3. c.f. Düntzer 26 II p.401, to Herder, 1st Sep. 1787.
4. c.f. Caroline 69 I pp.255-256.
5. c.f. Schauer 51 II p.222, to Caroline, 9. Sep. 1772.
6. c.f. Düntzer 29 II p.35, Caroline to Knebel, 5. Nov. 1802.
7. c.f. Düntzer 28 I p.306, Caroline to Gleim, 6. Jan. 1803, etc.
8. Haym 68 II p.334.
9. op.cit. II p.263 note.
10. op.cit. II p.262.
11. Düntzer 28 III pp.294-297.
12. Haym 68 II p.263.
13. op.cit. II p.249.
14. c.f. Wagner 59 p.474, 11. Nov. 1785.
15. c.f. Düntzer 26 II p.402.
16. Hettner 35 p.206, to Sömmering, 5. March 1785.
17. Caroline 69 III p.109.
18. Düntzer 28 III p.127, to Herder, 4. Dec. 1798.
19. Caroline 69 III p.255.
20. Zöckler 243 II p.268.
21. Witte 186 p.249.
22. Sauter 116 p.88.
23. Temkin 128 p.241.
24. c.f. Düntzer 26 II p.235 (introduction) and Jacobi 40 VI p.243 et seq.
25. Temkin 128 p.243.
26. Siegel 176 p.231 note 4.
27. Hansen 85 p.14; c.f. Nordenskiöld 230 p.315.
28. c.f. Bruntsch 78 p.84.
29. Schwarz 121 p.152.
30. Haym 68 II p.263.
31. Ratzel 109.
32. F. Ratzel, Anthropo=Geographie, Bd. 1, Stuttgart, 1882, pp.6 & 27.
33. op.cit. p.55.
34. Ratzel 109 p.46.

35. Götz 82 p.175.
36. Schütze 119 p.554.
37. F.A. Carus, Geschichte der Psychologie, in Nachgelassene Werke, III. Theil, Leipzig, 1808, pp.676-678.
38. Haym 68 II p.203.
39. SWS 14, 697, Suphan's „Schlußwort".
40. c.f. Gillies 67 p.115 and Gillies 145.
41. Clark 66 pp.300-301.
42. Rouché 170 p.533 note.
43. loc.cit.
44. Jacoby 153 pp.22-23.
45. Rasch 73 p.128.
46. Haym 68 II p.206.
47. Bruntsch 78 p.81.
48. Goethes Werke, Weimar edn., I. Abth., Bd. XLI^2 p.345.
49. Siegel 176 pp.XIV-XV (introduction).
50. Haym 68 II pp.296 & 784; c.f. ibid. I pp.675-676.
51. Temkin 128 p.241.
52. Siegel 176 pp.79-80 & p.232, note.
53. c.f. Hoffmann 36 p.69, Caroline to J. v. Müller, Jan.-Feb. 1804.
54. Caroline 69 III pp.260-263.
55. O. Walzel, Deutsche Romantik, 2.-3. Auflage, Leipzig, 1912 p.11.
56. c.f. Sell 175 p.71.
57. Bürkner 65 p.198.
58. Wilhelmsmeyer 185 p.234.
59. Witte 186 p.255.
60. c.f. Nordenskiöld 230 pp.288-289.
61. Sell 175 p.100.
62. Max Müller, Natural Religion, The Gifford Lectures, 1888, publ. London, 1889, pp.261-264.
63. Needham 200 p.233.
64. Nordenskiöld 230 p.269.
65. Needham 200 p.186.
66. op.cit. p.198.
67. Caspar-Kepler 300 p.70.
68. Witte 186 p.238; also quoted by Sauter 116 p.88.
69. SWS 16, 308-309, Zerstreute Blätter, 1797.

Bibliography.

Additional works consulted, including Herder's unpublished manuscripts, are referred to in the notes to the text.

1) Bibliographical works.

1. Berger, D.: Herder=Schrifttum 1916-1953, in: E. Keyser (ed.), Im Geiste Herders, Gesammelte Aufsätze zum 150. Todestage J.G. Herders, Kitzingen am Main, 1953, pp.268-305.

2. Berger, D.: Herder=Schrifttum 1953-1957, mit Nachträgen aus früheren Jahren, in: W. Wiora (ed.), Herder=Studien, Würzburg, 1960, pp.121-135.

3. Bibliographie der deutschen Zeitschriftenliteratur, 1938-1963.

4. Bibliotheca Herderiana, Vimariae, 1804.

5. Eppelsheimer, H.: Bibliographie der deutschen Literaturwissenschaft, 1945-1962 (5 vols.).

6. Goedeke, K.: Grundriß zur Geschichte der deutschen Dichtung, IV, 1, 3. Auflage, Dresden, 1916.

7. Irmscher, H.: Der handschriftliche Nachlaß Herders und seine Neuordnung, in: W. Wiora (ed.), Herder=Studien, Würzburg, 1960, pp.1-15.

8. Irmscher, H.: Typescript catalogue of Herder's MSS in Tübingen University Library (Stiftung Preussischer Kulturbesitz, Depot der Staatsbibliothek. Tübingen).

9. Jahresberichte über die Erscheinungen auf dem Gebiet der germanischen Philologie Bd. 1-42, 1879-1920.

   Jahresberichte über die wissenschaftlichen Erscheinungen auf dem Gebiet der neueren deutschen Literatur, Neue Folge, Bd. 1-19, 1921-1939.

   Jahresbericht für deutsche Sprache und Literatur, Bd. 1, 1940-1945.

10. Jahresverzeichnis der deutschen Hochschulschriften, Bd. 1-77, 1885-1962.

11. Körner, J.: Bibliographisches Handbuch des deutschen Schrifttums, 3. Ausgabe, Bern, 1949.

12. Kosch, W.: Deutsches Literatur=Lexikon, 2. Ausgabe, Bd. 2, Bern, 1953.

13. Unger, R.: Zur neueren Herderforschung; Germanisch=Romanische Monatsschrift, Bd. 1, 1909, pp.145-168.

14. The Year's Work in Modern Language Studies, 1930-1962.

Extensive Herder bibliographies are also attached to Nos. 66 (Clark), 67 (Gillies) and 170 (Rouché) below.

2) Herder's works.

(See notes to text for Herder's unpublished manuscripts).

15. Burkhardt, F.H. (ed.): God, Some Conversations, translated with notes, New York, 1940.

16. Gillies, A. (ed.): Journal meiner Reise im Jahre 1769, Oxford, 1947.

17. Irmscher, H. (ed.): Aus Herders Nachlaß; Euphorion, Bd. 54, 1960, pp.281-294.

18. Kühnemann, E. (ed.): Ideen zur Philosophie der Geschichte der Menschheit, in: Herders Werke, Kürschners Deutsche National=Literatur Ausgabe.

19. Martin, G. (ed.): Herder als Schüler Kants; Kantstudien Bd. 41, 1936, S. 294-306 (like No. 17 above, contains previously unpublished material).

20. Suphan, B. (ed.): Herders Sämmtliche Werke, Bd. 1-33, Berlin, 1877-1913.

3) Herder's correspondence and other contemporary biographical documents.

21. Baechtold, J. (ed.): Aus dem Herderschen Hause, Aufzeichnungen J.G. Müllers (1780-1782), Berlin, 1881.

22. Bojanowski, E. v.: Briefe Herders zur Erziehung des Erbprinzen Karl Friedrichs, in: Die Großherzogin Luise, Stuttgart und Berlin, 1905.

23. Boxberger, R. (ed.): Briefe Herders an C.A. Böttiger; Jahrbuch der königl. Akademie gemeinnütziger Wissenschaften zu Erfurt, Neue Folge, Heft XI, Erfurt, 1882, pp.79-112.

24. Deetjen, W. (ed.): Aus Herders letztem Lebensjahr; Jahrbuch der Goethe=Gesellschaft, XIV, 1928, pp.117-129.

25. Dobbek, W. (ed.): Herders Briefe (Auswahl), Weimar, 1959 (contains some hitherto unpublished letters).

26. Düntzer, H. and F.G. v. Herder (eds.): Aus Herders Nachlaß, Frankfurt a. M., 1856 (3 vols.).

27. Düntzer, H. and F.G. v. Herder (eds.): Herders Reise nach Italien, Gießen, 1859.

28. Düntzer, H. and F.G. v. Herder (eds.): Von und an Herder, Leipzig, 1862 (3 vols.).

29. Düntzer, H. (ed.): Zur deutschen Literatur und Geschichte, Ungedruckte Briefe aus Knebels Nachlaß, Nürnberg, 1858 (2 vols.) (contains letters from Caroline Herder to Knebel).

30. Gebhardt, P. v. and H. Schauer (eds.): J.G. Herder, seine Vorfahren und seine Nachkommen, 2 Teile in 1, Leipzig, 1930.

31. Gelzer, H. (ed.), Aus Herders Briefwechsel (with J.G. Müller); Protestantische Monatsblätter, Bd. 14, pp.81-125, 205-217 & 247-299.

32. Goethe: Werke (Weimar edn., 1887-1912), IV. Abtheilung, Briefe.

33. Hamann: F. Roth (ed.): Schriften, Berlin, 1821-1843, 8 Bde. in 9, Bd. 3, 5, 6, 7 (letters to Herder).

34. Herder, E.G. v. (ed.): J.G. v. Herders Lebensbild, Erlangen, 1846, 3 Bde. in 6 (our references are to Bd. I-VI).

35. Hettner, H. (ed.): G. Forsters Briefwechsel mit S.T. Sömmering, Braunschweig, 1877 (contains 2 letters concerning Herder's „Ideen").

36. Hoffmann, K.E. (ed.): J. v. Müller, Briefwechsel mit J.G. Herder und Caroline v. Herder, 1782-1808, Schaffhausen, 1952.

37. Hoffmann, O. (ed.): Herders Briefe an J.G. Hamann, Berlin, 1889.

38. Hoffmann, O. (ed.): Herders Briefwechsel mit Nikolai, Berlin, 1887.

39. Jacobi, F.H.: Auserlesener Briefwechsel, Leipzig, 1825-1827 (2 vols.).

40. Jacobi, F.H.: Werke, esp. Bd. 3, Leipzig, 1816 (contains letters to and from Herder).

41. Kant: Schriften, Preußische Akademie der Wissenschaften, Berlin, 1902 et seq., Bd. 10-13, Briefe.

42. Lessing: K. Lachmann (ed.): Sämmtliche Schriften, Bd. 12, Leipzig, 1857 (contains 3 letters to Herder).

43. Lichtenberg, G.C.: Vermischte Schriften, Bd. 7-8, Briefe, Göttingen, 1846.

44. Lindemann, R. (ed.): Beiträge zur Charakteristik K.A. Böttigers und seiner Stellung zu J.G. v. Herder, Görlitz, 1883.

45. Lisch, G.C.F. (ed.): Geschichte und Urkunden des Geschlechts Hahn, Bd. 4, Schwerin, 1856 (contains letters from Herder to von Hahn).

46. Maurer=Constant, J.H. (ed.): J. v. Müllers Sämmtliche Werke, Bd. 6, Schaffhausen, 1840 (contains letters from Herder and Caroline).

47. Meyer, F.L.W.: Zur Erinnerung an F.L.W. Meyer, den Biographen Schröders, Lebensskizze nebst Briefen, 2 Teile, Braunschweig, 1847 (contains letters from Herder).

48. Müller, A. (ed.): Unbekannte Briefe Herders und seiner Gattin an ihre Darmstädter Verwandten; Jahrbuch der Goethe=Gesellschaft, XXI, 1935, pp.108-151.

49. Pawel, J. (ed.): Ungedruckte Briefe Herders und seiner Gattin an Gleim; Zeitschrift für deutsche Philologie XXIV, 1891, pp.342-368 and XXV, 1892, pp.36-70.

50. Reichelt, J. (ed.): Unveröffentlichte Briefe von Caroline u. J.G. v. Herder; Das Literarische Echo, 16. Jahrgang, 1913-1914, pp.73-80, 159 and 164.

51. Schauer, H. (ed.): Herders Briefwechsel mit Caroline Flachsland; Schriften der Goethe=Gesellschaft, Nr. 39, 1926 and Nr. 41, 1928 (Bd. I und II).

52. Schauer, H. (ed.): Herders Dresdener Reise, Dresden, 1929.

53. Schneider, H. (ed.): Zwei Briefe v. J.G. Herder an J.A. Ebert; Euphorion, Bd. 27, 1926, pp.344-346.

54. Stapf, P. (ed.): Jean Paul und Herder, Der Briefwechsel Jean Pauls und Karoline Richters mit Herder und der Herderschen Familie in den Jahren 1785 bis 1804, Bern und München, 1959.

55. Stokar, K.: J.G. Müller, Lebensbild, Basel, 1885 (contains letters to and from Herder).

56. Suphan, B. (ed.): Briefe von Goethe und Herder; Vierteljahrsschrift für Literaturgeschichte, V, 1892, pp.97-113 (Herder to Max von Knebel).

57. Unger, R.: Herder, Novalis und Kleist, Studien über die Entwicklung des Todesproblems in Denken und Dichten vom Sturm und Drang zur Romantik, Frankfurt a.M., 1922 (contains a letter from Herder to Mendelssohn).

58. Varnhagen v. Ense, K.A. und T. Mundt (eds.): K.L. v. Knebels literarischer Nachlaß und Briefwechsel, Leipzig, 1840 (3 vols.).

59. Wagner, K. (ed.): Briefe an J.H. Merck, von Goethe, Herder, Wieland und andern bedeutenden Zeitgenossen, Darmstadt, 1835.

60. Wagner, K. (ed.): Briefe an und von J.H. Merck, Darmstadt, 1838.

61. Wagner, K. (ed.): Briefe aus dem Freundeskreise von Goethe, Herder, Höpfner und Merck, Leipzig, 1847.

62. Wahle, J. (ed.): Ein Brief Herders an Goethe; Jahrbuch der Goethe=Gesellschaft, XIV, 1928, pp.97-99.

63. Wehningen, O.: Goethes Brief an J.G. Herder vom 4. IX.1788, Leipzig, 1908 (is really only an anthology from Goethe's works).

64. Weimarisches Herder=Album, Jena, 1845, esp. pp.9-46 (letters from Herder).

Further original biographical material of great importance is contained in No. 69 below (Caroline v. Herder's memoirs).

4) Biographies.

65. Bürkner, R.: Herder, Berlin, 1904.

66. Clark, R.T., Jnr.: Herder, His Life and Thought, Berkeley & Los Angeles, 1955.

67. Gillies, A.: Herder, Oxford, 1945.

68. Haym, R.: Herder nach seinem Leben und seinen Werken dargestellt, Berlin, 1877-1885.

69. Herder, Maria Caroline v.: Erinnerungen aus dem Leben J.G. Herders (ed. G. Müller), Stuttgart und Tübingen, 1830 (3 vols. in 1).

70. Kühnemann, E.: Herder, 3. Ausgabe, München, 1927.

71. Kühnemann, E.: Herders Persönlichkeit in seiner Weltanschauung, Berlin, 1893.

72. McEachran, F.: Life and Philosophy of J.G. Herder, Oxford, 1939.

73. Rasch, W.: Herder, Sein Leben und sein Werk im Umriß, Halle, 1938.

74. Reisiger, H.: Herder, Sein Leben in Selbstzeugnissen, Briefen und Berichten, Berlin, 1942.

5) Works on Herder's scientific thought.

75. Bärenbach, F. v.: Herder als Vorgänger Darwins und der modernen Natur=philosophie, Berlin, 1877.

76. Bosch, F.: Herder und Darwin; Kölnische Zeitung, Literarische Beilage Nr. 45-46, 6. und 13. Nov. 1913.

77. Boucke, E.: Goethes Weltanschauung auf historischer Grundlage. Ein Beitrag zur Geschichte der dynamischen Denkrichtung und Gegensatzlehre, Stuttgart, 1907. (Pp.1-183 of this work contain a history of dynamistic and "dialectical" ideas, with interesting chapters on Kant and Herder.)

78. Bruntsch, F.: Die Idee der Entwicklung bei Herder, von geographischen Gesichtspunkten aus betrachtet, Crimmitschau (Diss. Leipzig), 1904.

79. Clark, R.T., Jnr.: Herder's Conception of „Kraft"; Publications of the Modern Language Association of America, LVII, 3, Sep. 1942, pp.739-752.

80. Dobbek, W.: Die coincidentia oppositorum als Prinzip der Weltdeutung bei J.G. Herder wie in seiner Zeit, in: W. Wiora (ed.), Herder=Studien, Würzburg, 1960, pp.16-47 (concerns Herder's "dialectical method").

81. Erhard, H.: Biologie bei Herder und Goethe; Verhandlungen der schweizerischen Naturforschenden Gesellschaft, Bd. 135, 1955, pp.171-172.

82. Götz, H.: Herder als Psychologe, Leipzig (Diss. Zürich), 1904.

83. Götz, H.: War Herder ein Vorgänger Darwins?; Vierteljahrsschrift für wissenschaftliche Philosophie und Soziologie, 26. Jahrgang, Neue Folge I, 1902, pp.391-422.

84. Grundmann, J.: Die geographischen und völkerkundlichen Quellen und Anschauungen in Herders „Ideen zur Philosophie der Geschichte der Menschheit", Berlin (Diss. Leipzig), 1900.

85. Hansen, A.: Haeckels „Welträtsel" und Herders Weltanschauung, Gießen, 1907.

86. Hansen, A.: Herders Beziehungen zur Deszendenzlehre; Archiv für die Geschichte der Naturwissenschaften und der Technik, Bd. 4, 1912, pp.307-314.

87. Hansen, A.: Herders „Ideen zur Philosophie der Geschichte der Menschheit"; Königlich Priviligierte Berlinische Zeitung (Vossische Zeitung), Feuilleton, 12. Sep. 1909.

88. Harich, W.: Ein Kant=Motiv im philosophischen Denken Herders; Deutsche Zeitschrift für Philosophie, 2. Jahrgang, 1954, pp.43-68 (concerns Herder's "dialectical method").

89. Hauck, P.: Herders Stellung zur Schulgeographie; Zeitschrift für die Erdkundeunterricht, 1961, Nr. 13, pp.450-463.

90. Headstrom, B.: Herder and the Theory of Evolution; The Open Court, XLIII, 1929, pp.596-601.

91. Karppe, S.: Herder, précurseur de Darwin, in: Essais de Critique et d'Histoire de Philosophie, Paris, 1902, pp.189-210.

92. Kneib, -: Haeckel und Herder; Kölnische Volkszeitung, Literarische Beilage Nr. 17, 25. April 1907, pp.125-126.

93. Kohlbrugge, J.: Herders Verhältnis zu modernen Naturanschauungen; Die Naturwissenschaften, I, 1913, pp.1110-1116.

94. Koller, A.H.: Herder's Conception of Milieu; Journal of English and Germanic Philology, XXIII, 1924, pp.217-240 and 370-388 (unfinished article).

95. L., Dr. L. -: Herder und die Tierseele; Wiener Abendpost, Feuilleton, Nr. 288, 1903.

96. Lehmann, F.W.: Herder in seiner Bedeutung für die Geographie, Berlin, 1883.

97. Lehmann, W.: Herder's Contribution toward an Empirical Sociology and Cultural Anthropology; Sociologus, Vol. 10, 1960, pp.17-33.

98. Lehwalder, H.: Herders Lehre vom Empfinden, Versuch einer Interpretation von Herders Schrift „Vom Erkennen und Empfinden", Diss. Kiel, 1954.

99. Lovejoy, A.O.: Some Eighteenth Century Evolutionists; Popular Science Monthly, LXV, 1904, pp.238-251 and 323-340.

100. Lovejoy, A.O.: Some Eighteenth Century Evolutionists; Scientific Monthly, LXXI No. 3, Sep. 1950, pp.162-178 (is a reprinted version of No. 99 above).

101. May, W.: Herders Anschauung der organischen Natur; Archiv für die Geschichte der Naturwissenschaften und der Technik, Bd. 4, 1912, pp.8-39 and 89-113.

102. May, W.: Kant und Herder als Vorläufer Weismanns; Naturwissenschaftliche Wochenschrift, Neue Folge, Bd. 16, 1917, pp.223-224.

103. Münz, L.: Herder und die Experimental=Psychologie; Archiv für das Blindenwesen, 1. Jahrgang, 1934, Nr. 1, pp.3-13.

104. Neumann, E.W.: Herders Naturphilosophie; Natur: Illustrierte Halbmonatsschrift, 13. Jahrgang, 1921-1922, pp.125-127.

105. Neumann, E.: Herders Naturphilosophie und Entwicklungstheorie; Zeitschrift für die gesamte Naturwissenschaft, 7. Jahrgang, 1941, pp. 352-361.

106. Noll, R.: Herders Verhältnis zur Naturwissenschaft und dem Entwicklungs=gedanken; Archiv für Geschichte der Philosophie, Neue Folge, XIX, 1913, pp.302-338.

107. Paulsen, F.: Haeckels „Welträtsel" und Herders Weltanschauung; Deutsche Literaturzeitung, Bd. 28, 1907, 30. March (review of No. 85 above).

108. Probst, E.: Herder als Psychologe, Laupen bei Bern (Diss. Bern), 1925.

109. Ratzel, F.: Das geographische Bild der Menschheit. Eine Centennial=betrachtung; Deutsche Rundschau, Bd. 48, 1886(?), pp.40-62.

110. Reimann, P.: Herder und die dialektische Methode; Unter dem Banner des Marxismus, 3. Jahrgang, 1929, pp.52-77.

111. Richter, A.: Die psychologische Grundlage in der Pädagogik Herders, Neugersdorf (Diss. Leipzig), 1900.

112. Rothe, K.: Herder und Haeckel; Mitteilungen der Sektion für Naturkunde des österreichischen Touristen=Klub, 20. Jahrgang, Nr. 1, 1908, pp.10-13.

113. Rouché, M.: Herder précurseur de Darwin? Histoire d'un mythe, Paris, 1940.

114. Rüdiger, H.: Herders Anthropologie; Neue Zürcher Zeitung, Fernausgabe, Nr. 21, 1948, Blatt 1-2.

115. Sadee, L.: Zum 125. Jubiläum der „Ideen"; Zeitschrift für das Gymnasialwesen, (Bd.) 9, 1911.

116. Sauter, E.: Herder und Buffon, Rixheim (Diss. Basel), 1910.

117. Schmidt=Cürtow, W.: Ist Herder ein Vorgänger Darwins und der modernen Naturphilosophie?; Der Beweis des Glaubens, Monatsschrift, Gütersloh, 1878, pp.72-76 and 138-149.

118. Schütze, M.: Herder's Conception of „Bild"; Germanic Review, I, 1926, pp.21-35.

119. Schütze, M.: Herder's Psychology; The Monist, Vol. 35, 1925, pp.507-554.

120. Schwarz, G.: J.G. Herder, Seine Stellung zur Landschaft und seine Bedeutung für die Geographie, in: Landschaft und Land, Festschrift Erich Obst zum 65. Geburtstag gewidmet, Remagen, 1951, pp.169-187.

121. Schwarz, G.: J.G. v. Herder und Karl Ritter, eine geistesgeschichtliche Parallele; Jahrbuch der technischen Hochschule Hannover, 1952, pp.149-159.

122. Schwind, M.: Die geographischen „Grundlagen" der Geschichte bei Herder, Hegel und Toynbee; Erdkunde, Archiv für wissenschaftliche Geographie, Bd. 14, 1960, pp.3-10.

123. Sommer, H. (review of No. 75 above - Bärenbach); Göttinger Gelehrte Anzeigen, Bd. 1, 1878, pp.245-256.

124. Spitz, L.: Natural Law and the Theory of History in Herder; Journal of the History of Ideas, Vol. 16, 1955, pp.453-475.

125. Stein, R.: Naturwissenschaftliches bei Lessing und Herder, in: Historische Studien, Festgabe Georg Sticker zum 70. Geburtstag dargeboten, Berlin, 1930, pp.112-117.

126. Steinborn, W.: Natur und Mensch bei Herder, Ein Beitrag zur Geschichte der Anthropogeographie, Diss. Halle a.S., 1922.

127. Tansill, C.: Racial Theories in Germany from Herder to Hitler; Thought, XV No. 58, Sep. 1940, pp.453-468 (only briefly mentions Herder).

128. Temkin, O.: German Concepts of Ontogeny and History around 1800; Bulletin of the History of Medicine, XXIV, 1950, pp.227-246.

129. Troeltsch, E.: Der Entwicklungsbegriff und der Evolutionismus, in: Gesammelte Schriften, Bd. 2, Tübingen, 1913, pp.294-324.

130. Vielhaber, W.: Herder und der Darwinismus; Der Monismus, 4. Jahrgang, 1909, pp.97-103.

131. Weis, L.: Herder und die moderne Naturphilosophie; Philosophische Monatshefte, Bd. 14, 1878, pp.272-279.

132. Wells, G.A.: Herder and After, A Study in the Development of Sociology, 's-Gravenhage, 1959 (Anglica Germanica No. 1).

133. Wells, G.A.: Herder's Determinism; Journal for the History of Ideas, Vol. 19, 1958, pp.105-113.

A few further items, mainly brief mentions within larger reference works, are listed in No. 170 below (Rouché).

Nos. 66 (Clark), 170 (Rouché) and 173 (Schütze) are works on Herder which devote considerable attention to his scientific thought.

6) Works on other aspects of Herder's thought.

134. Andress, J. Mace: J.G. Herder as an Educator, New York, 1916.

135. Barnard, F.M.: Zwischen Aufklärung und politischer Romantik, Eine Studie über Herders soziologisch=politisches Denken, Berlin, 1964.

136. Berger, A.E.: Der junge Herder und Winckelmann, Halle, 1903.

137. Berger, F.: Menschenbild und Menschenbildung, die philosophisch=pädagogische Anthropologie Herders, Stuttgart, 1933.

138. Birkner, S.: Die Mechanisierung des Lebens im Werk J.G. Herders, Diss. Frankfurt, 1957.

139. Blumenthal, E.: Herders Auseinandersetzung mit der Philosophie Leibnizens, Diss. Hamburg, 1934.

140. Bruford, W.H.: Culture and Society in Classical Weimar, 1775-1806, Cambridge, 1962 (contains an interesting account of Herder's ideas on history and „Humanität").

141. Clark, R.T., Jnr.: The Psychological Framework of Goethe's „Werther"; Journal of English and Germanic Philology, XLVI, 3, July, 1947.

142. Dachauer, M.: Untersuchung zu einem Lebensbild bei Herder, Diss. Wien, 1932.

143. Dobbek, W.: Die Kategorie der Mitte in der Kunstphilosophie J.G. Herders, in: Worte und Werte, Festschrift Bruno Markwardt zum 60. Geburtstag dargebracht, Berlin, 1961, pp.70-78.

144. Gillies, A.: Herder and Faust; Publications of the English Goethe Society, Vol. 16, 1946 (publ. 1947), pp.90-111.

145. Gillies, A.: Herder and Goethe, in: German Studies, presented to L.A. Willoughby, Oxford, 1952, pp.82-97.

146. Gillies, A.: Herder's Approach to the Philosophy of History; Modern Language Review, XXXV, 1940, pp.193-206.

147. Gillies, A.: Herder und Ossian, Berlin, 1933.

148. Gillies, A.: The Macrocosm-Sign in Goethe's „Faust", and Herder's Mystic Hexagon; Modern Language Review, XXXVI, 1941, pp.397-399.

149. Hauffe, G.: Herder in seinen „Ideen zur Philosophie der Geschichte der Menschheit", Borna=Leipzig, 1890.

150. Hirschfeld, A.: Die Natur als Hieroglyphe, Breslau, 1936 (pp.28-45 contain observations on Herder's attitude to nature).

151. Hölzel, A.: Die persönlichen und geistigen Beziehungen zwischen Goethe und Herder in der Weimarer Zeit, Diss. Wien, 1939.

152. Hoffart, E.: Herders „Gott", Halle a.S., 1918.

153. Jacoby, G.: Herder als Faust, Leipzig, 1911.

154. Keller, J.: Herders Worte: „Licht, Liebe, Leben", in: Gesammelte Reden und Abhandlungen, Bd. 1, Karlsruhe und Leipzig, 1913 (too general to be of much value).

155. Kern, H.: Die Philosophie des Lebens von Herder bis zur Gegenwart, Stettin, 1929 (pp.9-14 are devoted to Herder's "organic" theories).

156. Kirchner, R.: Entstehung, Darstellung und Kritik der Grundgedanken von Herders „Ideen", Diss, Leipzig, 1881 (is virtually a summary of the „Ideen").

157. Koch, F.: Herder und die Mystik; Blätter für deutsche Philosophie, Bd. 1, Berlin, 1927-1928, pp.5-29.

158. Kronenberg, M.: Herders Philosophie nach ihrem Entwicklungsgang und ihrer historischen Stellung, Heidelberg, 1889.

159. Kuhfus, H.: Gott und Welt in Herders „Ideen zur Philosophie der Geschichte der Menschheit", Diss. Münster, 1938.

160. Lamprecht, K.: Herder und Kant als Theoretiker der Geschichtswissenschaft; Jahrbücher für Nationalökonomie und Statistik, LXIX (3. Folge Bd. XIV), 1897, pp.161-203.

161. Linden, B. v.d.: Die Idee des Menschen bei Herder, verglichen mit dem modernen Menschenbild Arnold Gehlens, Diss. Bonn, 1951.

162. Lindner, H.: Das Problem des Spinozismus im Schaffen Goethes und Herders, Weimar, 1960.

163. Litt, T.: Kant und Herder als Deuter der geistigen Welt, Leipzig, 1930.

164. Loerke, O.: Herders Weltgebäude; Neue Rundschau XLVI, 1935, pp.561-593.

165. Meinecke, F.: Die Entstehung des Historismus, München und Berlin, Bd. 2, 1936 (pp.383-479 are devoted to Herder's philosophy of history).

166. Pamp, F.: „Palingenesie" bei C. Bonnet, Herder und Jean Paul, Diss. Münster, 1955.

167. Pascal, R.: Herder and the Scottish Historical School; Publications of the English Goethe Society, Vol. 14, 1938-1939, pp.23-42.

168. Posadzy, L.: Der entwicklungsgeschichtliche Gedanke bei Herder, Posen (Diss. Münster), 1906.

169. Regli, P.: I. Iselins „Geschichte der Menschheit". Eine Vorarbeit zu J.G. Herders „Ideen"?; Leipzig (Diss. München), 1919.

170. Rouché, M.: La philosophie de l'histoire de Herder, Paris, 1940.

171. Schaede, E.J.: Herders Schrift „Gott" und ihre Aufnahme bei Goethe, Berlin, 1934.

172. Schmidt, F.: Herders pantheistische Weltanschauung, Diss. Berlin, 1888.

173. Schütze, M.: The Fundamental Ideas in Herder's Thought; Modern Philology, Vol. XVIII (1920-1921), pp.65-78 and 289-302; Vol. XIX (1921-1922), pp.113-130 and 361-382; Vol. XXI (1923-1924), pp.29-48 and 113-132.

174. Schweitzer, B.: J.G. Herders „Plastik" und die Entstehung der neueren Kunstwissenschaft, Leipzig, 1948.

175. Sell, K.: Die Religion unserer Klassiker, 2. Ausgabe, Tübingen, 1910 (pp.62-132 are devoted to Herder's religious beliefs).

176. Siegel, C.: Herder als Philosoph, Stuttgart und Berlin, 1907.

177. Sommerhalder, H.: Herder in Bückeburg als Deuter der Geschichte, Frauenfeld/Leipzig, 1945.

178. Stadelmann, R.: Der historische Sinn bei Herder, Halle a.S., 1928.

179. Steig, R.: Herders Verhältnis zu Lavaters „Physiognomischen Fragmenten"; Euphorion, Bd. 1, 1894, pp.540-557.

180. Strothmann, E.: Das scholastische Erbe im Herderschen „Pantheismus"; Dichtung und Volkstum, Bd. 37, 1936, pp.174-187.

181. Suphan, B.: Goethe und Herder; Deutsche Rundschau, Bd. 52, 1887, pp.63-76.

182. Suphan, B.: Herder als Schüler Kants; Zeitschrift für deutsche Philologie IV, 1873, pp.225-237.

183. Unger, R.: Zur Geschichte des Palingenesiegedankens im 18. Jahrhundert; Deutsche Vierteljahrsschrift für Literaturwissenschaft und Geistesgeschichte, Bd. 2, 1924, pp.257-274.

184. Wells, G.A.: Man and Nature: an Elucidation of Coleridge's Rejection of Herder's Thought; Journal of English and Germanic Philology, LI, 1952, pp.314-325.

185. Wilhelmsmeyer, H.: Der Totalitätsgedanke als Erkenntnisgrundsatz und als Menschheitsideal von Herder zu den Romantikern; Euphorion, Bd. 34, 1933, pp.211-243.

186. Witte, J.: Die Philosophie unserer Dichterheroen, Bd. 1, Lessing und Herder, Bonn, 1880 (pp.237-355 are devoted to Herder).

187. Wittig, H.: J.G. Herder, Zur Geschichte seines Menschenbildes; Schola, Monatsschrift für Erziehung, 5. Jahrgang, 1950, pp.25-38.

188. Wolff, H.M.: Der junge Herder und die Entwicklungsidee Rousseaus; Publications of the Modern Language Association of America, LVII, 1942, pp.753-819.

See also No. 57 above (Unger) on Herder and the problem of „Palingenesie".

7) The philosophy of science.

189. Bertalanffy, L. v.: Modern Theories of Development. An Introduction to Theoretical Biology, 2nd English edn., Harper Science Library, New York, 1962.

190. Bertalanffy, L. v.: Problems of Life, 2nd English edn., Harper Science Library, New York, 1960.

191. Braithwaite, R.: Teleological Explanation; proceedings of the Aristotelian Society, 1946-1947, pp.i-xx.

192. Cohen, J.: Teleological Explanation; Proceedings of the Aristotelian Society, 1950-1951, pp.255-292.

193. Engels, F.: Dialectics of Nature, ed. J.B.S. Haldane, London, 1941.

194. Hesse, M.B.: Models and Analogies in Science, Newman History and Philosophy of Science Series, No. 14, London, 1963.

195. Hook, S.: Dialectic in Society and History, in: H. Feigl and M. Brodbeck (eds.), Readings in the Philosophy of Science, New York, 1953, pp.701-713.

196. Lange, F.: Geschichte des Materialismus, Iserlohn, 1873-1875 (2 vols.) (see esp. Bd. 2, pp.202-220; 244-249; 273-284 and 370-374).

197. Martin, G.: Kants Metaphysics and Theory of Science, transl. P. Lucas, Manchester, 1955.

198. Models and Analogues in Biology; Symposia of the Society for Experimental Biology, No. XIV, Cambridge, 1960.

199. Nagel, E.: Teleological Explanation and Teleological Systems, in: H. Feigl and M. Brodbeck (eds.), Readings in the Philosophy of Science, New York, 1953, pp.537-558.

200. Needham, J.: Time, The Refreshing River (Essays and Addresses, 1932-1942), 2nd impression, London, 1948 (see esp. pp.178-206 "A Biologist's View of Whitehead's Philosophy" and pp.233-272 "Integrative Levels, a Revaluation of the Idea of Progress", Herbert Spencer Memorial Lecture, Oxford, 1937).

201. Nilson, S.: Mechanics and Historical Laws; Journal of Philosophy, Vol. 48, 1951, pp.201-211.

202. Popper, K.R.: The Poverty of Historicism, London, 1957.

203. Popper, K.R.: What is Dialectic?; Mind, 1940, pp.403-426.

204. Russell, B.: The Scientific Outlook, London, 1931.

205. Toulmin, S.: The Philosophy of Science, Hutchinson's University Library, London, 1953, reprinted 1955.

206. Whewell, W.: History of the Inductive Sciences, Vol. 3, London, 1837, esp. p.456 et seq. (contains interesting observations on teleology in science by an eminent inductionist).

207. Whitehead, A.N.: Science and the Modern World, Cambridge, 1926.

208. Zilsel, E.: Physics and the Problem of Historico-Sociological Laws, in: H. Feigl and M. Brodbeck (eds.), Readings in the Philosophy of Science, New York, 1953, pp.714-722.

For original texts by philosophers of science till the time of Herder, works on such philosophers, and works dealing with the history of scientific thought and philosophy in general, see Nos. 217, 221, 224, 226, 240, 241, 245, 246, 247, 263, 276, 287, 288, 290, 294, 295, 296, 301, 303, 304, 315, 316 and 317 below.

8) The History of Science.

a) Works on the history of science and of scientific thought.

209. Adams, F.D.: The Birth and Development of the Geological Sciences, Baltimore, 1938.

210. Baldwin, J. Mark: History of Psychology, London, 1913 (2 vols.).

211. Bell, A.E.: Newtonian Science, London, 1961.

212. Bertrand, A.: Du Magnétisme Animal en France, Paris, 1826.

213. Cajori, F.: A History of Physics in its Elementary Branches, New York, 1899.

214. Clerke, A.M.: History of Astronomy in the Nineteenth Century, Edinburgh, 1885.

215. Cumston, C.: An Introduction to the History of Medicine to the End of the Eighteenth Century, London, 1926.

216. Dessoir, M.: Geschichte der neueren deutschen Psychologie, Berlin, 1902 (2 vols.) (Bd. 1, pp.210-248; 400-412; 471-499; 500-528 are of especial interest for the history of scientific psychology).

217. Driesch, H.: History and Theory of Vitalism, London, 1914.

218. Farrington, B.: Science in Antiquity, Home University Library, London, 1936.

219. Forbes, G.: History of Astronomy, London, 1909.

220. Frazer, Sir J.G.: Creation and Evolution in Primitive Cosmogonies, London, 1935.

221. Goodfield, G.: The Growth of Scientific Physiology, Physiology and the Mechanist-Vitalist Controversy, Illustrated by the Problems of Respiration and Animal Heat, London, 1960.

222. Günther, F.: Die Wissenschaft vom Menschen im 18. Jahrhundert, Gotha, 1907.

223. Haddon, A.C.: History of Anthropology, London, 1910.

224. Jammer, M.: Concepts of Force. A Study in the Foundations of Dynamics, Cambridge/Mass., 1957.

225. Jeans, Sir J.: The Growth of Physical Science, 2nd (revised) edn., Cambridge, 1950.

226. Lovejoy, A.O.: The Great Chain of Being, 2nd impression, Cambridge/Mass., 1942.

227. Macgillivray, W.: Lives of Eminent Zoologists, 2nd edn., Edinburgh, 1834.

228. Masson, I.: Three Centuries of Chemistry, Phases in the Growth of a Science, London, 1925.

229. Needham, Joseph: A History of Embryology, Cambridge, 1934.

230. Nordenskiöld, E.: The History of Biology, transl. L.B. Eyre, London, 1932.

231. Pledge, H.T.: Science since 1500, H.M. Stationery Office, London, 1939.

232. Russell, Bertrand: Religion and Science, Home University Library, Oxford, 1935, reprinted 1949.

233. Sarton, G.: The Study of the History of Science (with an Introductory Bibliography, first publ. 1936, reprinted Dover Books, New York, 1957).

234. Scott Keltie, J., and O.J. Howarth, History of Geography, London, 1913.

235. Siegel, C.: Geschichte der deutschen Naturphilosophie, Leipzig, 1913 (pp.131-149 are devoted to Herder).

236. Singer, C.: Short History of Scientific Ideas, Oxford, 1959.

237. Thienemann, A.: Die Stufenfolge der Dinge, der Versuch eines natürlichen Systems der Naturkörper aus dem 18. Jahrhundert; Zoologische Annalen, 3, 1910, pp.185-274.

238. White, A.D.: History of the Warfare between Science and Theology in Christendom, New York, 1896 (2 vols.).

239. Whittaker, Sir E.: A History of the Theories of Aether and Electricity, revised edn., London, 1951 (Vol. 1, pp.1-127 cover the history of these theories up to and including the eighteenth century).

240. Willey, Basil: The Eighteenth Century Background, Studies on the Idea of Nature in the Thought of the Period, 7th impression, London, 1961.

241. Wolf, A.: A History of Science, Technology and Philosophy in the Eighteenth Century, London, 1938.

242. Woodward, H.B.: History of Geology, London, 1911.

243. Zöckler, O.: Geschichte der Beziehungen zwischen Theologie und Naturwissenschaft, mit besonderer Rücksicht auf Schöpfungsgeschichte, Gütersloh, 1879 (2 vols.).

See also No. 196 above and No. 299 below.

b) Works on or by scientists, scientific thinkers and philosophers who influenced Herder's scientific thought.

244. Abhandlungen der königlichen schwedischen Akademie der Wissenschaften, von A. Kästner übersetzt, Bd. 1-11, Hamburg, 1749-1753.

245. Bacon, Francis: Works, ed. Spedding, Ellis and Heath, Vols. IV & V, Translations of the Philosophical Works, London, 1858 (esp. Novum Organum, in Vol. IV).

246. Bacon, Francis: Benjamin Farrington, Francis Bacon, Philosopher of Industrial Science (Life of Science Library), New York, 1949.

247. Berkeley, G.: A New Theory of Vision, Dent, London, 1910, pp.1-86.

248. Blumenbach, J.F.: De Generis Humani Varietate Nativa, Göttingen, 1775 (Quotations are from the translation in T. Bendyshe, The Anthropological Treatises of J.F. Blumenbach, London, 1865, pp.65-143).

249. Blumenbach, J.F.: Über den Bildungstrieb, Göttingen, 1781. (Since this edition was not available, quotations are from the translation by A. Crichton: An Essay on Generation, London, 1792.)

250. Bode, J.E.: Anleitung zur Kenntnis des gestirnten Himmels, 6. Auflage, Berlin, 1792 (first published 1768).

251. Bode, J.E.: Aus einem Schreiben des Herrn Herschel an mich, in: J.E. Bode (ed.), Astronomisches Jahrbuch auf das Jahr 1786, Berlin, 1783, p.258 et seq. (Nos. 268-271 and No. 280 below are articles from the same series).

Bonnet, C.: see No. 166 above.

252. Boscovich, R.J.: L. Whyte (ed.), R.J. Boscovich, Studies of his Life and Work on the 250th Anniversary of his Birth, London, 1961.

253. Brugmans, A.: Beobachtungen über die Verwandtschaft des Magnets (transl. from the Latin by C. Eschenbach), Leipzig, 1781.

254. Brugmans, A.: Philosophische Versuche über die magnetische Materie (transl. C. Eschenbach), Leipzig, 1784.

255. Buffon, G.L. Leclerc, Comte de:
a) Histoire Naturelle, Tome Premier, 2e. Édition, Paris, 1750, pp.3-62 (De la manière d'étudier et de traiter l'Histoire Naturelle).
b) Article "Cochon", ed.cit., Tome Cinquième, 1755, pp.102-109.
Buffon, G.L. Leclerc, Comte de: see also No. 116 above.

256. Burke, E.: A Philosophical Enquiry into the Origin of our Ideas of the Sublime and the Beautiful, ed. J. Boulton, London, 1958 (influenced Herder's ideas on neurology and "dialectical" development).

257. Camper, Petrus: Auszüge aus zweyen in der Amsterdammer Malerakademie gehaltenen Vorlesungen, in: Campers Kleinere Schriften (transl. J. Herbell), Bd. 1, Leipzig, 1784, pp.11-23 (an earlier edition, used by Herder, appeared in 1781).

258. Camper, Petrus: Kurze Nachricht von der Zergliederung verschiedener Orang Utangs, in op.cit., pp.65-94 (reprinted from Philosophical Transactions, 1779, which Herder consulted).

259. Camper, Petrus: Rede über den Ursprung und die Farbe der Schwarzen, in op.cit., pp.24-49.

260. Crawford, A.: On the Power of Animals to create Coldness; Philosophical Transactions, Vol. 71, Pt. II, 1781, p.483 et seq.

261. Dalberg, Karl v.: Betrachtungen über das Universum, Erfurt, 1777.

262. Du Bos, Jean-Baptiste: A.H. Koller, The Abbé Du Bos, His Advocacy of the Theory of Climate. A Precursor of J.G. Herder, Champaign/Illinois, 1937.

263. Einsiedel, August v.: Ideen (ed., with introduction, by W. Dobbek), Berlin, 1957.

264. Euler, L.: Letters to a German Princess on different Subjects of Physics and Philosophy, transl. from the French by H. Hunter, London, 1795 (2 vols.) (the original French edition, St. Petersburg, 3 vols., 1768-1772, used by Herder, was not available).

265. Falconer, W.: Remarks on the Influence of Climate, Situation, Nature of Country, Population, Nature of Food and Way of Life on the Disposition and Temper, Manners and Behaviour, Intellects, Laws and Customs, Form of Government, and Religion of Mankind, London, 1781.

266. Galileo: Discoveries and Opinions of Galileo (transl. with an introduction and notes by Stillman Drake), New York, 1957.

267. Goethe: Naturwissenschaftliche Schriften, in Werke, ed.cit., II. Abtheilung, Bd. I-XIII, Weimar, 1890-1906.

268. Hahn, Erblandmarschall v.: Einige Beobachtungen über Mira Ceti, über die Nebelflecken in der Leyer und der Hydra, ingleichen eine neue Entdeckung des Herrn Dr. Herschels, den Wärmestoff betreffend, in J.E. Bode (ed.), Astronomisches Jahrbuch auf das Jahr 1803, Berlin, 1800, p.106 et seq.

269. Hahn, Erblandmarschall v.: Gedanken über die Sonne und ihr Licht, in op.cit., 1795, Berlin, 1792, pp.226-232.

270. Hahn, Erblandmarschall v.: Über den Nebelfleck im Orion, in op.cit., 1799, Berlin, 1796, p.235 et seq.

271. Hahn, Erblandmarschall v.: Über den planetarischen Nebelfleck bei μ Wasserschlange, in op.cit., 1802, Berlin, 1799, pp.231-233.

Hahn, Erblandmarschall v.: see also No. 45 above.

272. Haller, Albrecht v.: Anfangsgründe der Physiologie des menschlichen Körpers (transl. from the Latin by J.S. Halle), Bd. 8, Berlin und Leipzig, 1776 (first published 1766; is translation of Vol. 8 of the edition below).

273. Haller, Albrecht v.: Elementa Physiologiae Corporis Humani, Tomus 4, Lausanne, 1762 (see esp. Sectio VI, Nervi, pp.185-269).

274. Haller, Albrecht v.: Primae Lineae Physiologiae, Göttingae, 1747 (see esp. Cap. XII, De Cerebro (et nervis), pp.160-206).

275. Harris, J.: Three Treatises, the First concerning Art, the Second concerning Music, Painting and Poetry, the Third concerning Happiness, London, 1744 (influenced Herder's idea of „Kraft").

276. Hartley, David: Observations on Man, his Frame, his Duty and his Expectations, London, 1749 (2 vols.).

277. Hemsterhuis, F.: Lettre sur les désirs (1770) in: Oeuvres philosophiques, Tome 1, Paris, 1809, pp.61-90 (influenced Herder's ideas on polarity and on mathematical analogies). (See also F. Bulle, Franz Hemsterhuis und der deutsche Irrationalismus des 18. Jahrhunderts, Leipzig (Diss. Jena), 1911; pp.37-40 deal with Herder.)

278. Herschel, W.: Account of Some Observations tending to investigate the Construction of the Heavens, Philosophical Transactions, Vol. 74, Pt. II, 1784, pp.437-451.

279. Herschel, W.: On the Remarkable Appearances at the Polar Regions of the Planet Mars (etc.), in op.cit., pp.233-273.

280. Herschel, W.: Über die eigentlichen Nebelsterne, in: J.E. Bode (ed.), Astronomisches Jahrbuch auf das Jahr 1801, Berlin, 1798, pp.128-143.

281. Hippocrates, On Air, Water and Situation (De Aëre, Aquis et Locis, transl. by F. Clifton), London, 1734.

282. Huarte, Juan: The Examination of Men's Wits (transl. R.C. Esquire), London, 1616 (original title "Examen de Ingenios", also translated into German by Lessing).

283. Kant, Immanuel; Allgemeine Naturgeschichte und Theorie des Himmels (1755), in: Werke, Preußische Akademie der Wissenschaften, Bd. 1, Berlin, 1902, pp.215-368.

284. Kant, Immanuel: Bestimmung des Begriffs einer Menschenrace (1785), in: Werke, ed.cit., Bd. 8, pp.89-106.

285. Kant, Immanuel: Die Frage, ob die Erde veralte, physikalisch erwogen (1754), in: Werke, ed.cit., Bd. 1, pp.193-213.

286. Kant, Immanuel: Entwurf und Ankündigung eines Collegii der physischen Geographie (1757), in: Werke, ed.cit., Bd. 2, pp.1-12.

287. Kant, Immanuel: Gedanken von der wahren Schätzung der lebendigen Kräfte (1747), in: Werke, ed. cit., Bd. 1, pp.5-181.

288. Kant, Immanuel: Kritik der Urteilskraft, Zweiter Teil, Kritik der teleologischen Urteilskraft (1790), in: Werke, ed.cit., Bd. 5, pp.357-485.

289. Kant, Immanuel: Nachricht von der Einrichtung seiner Vorlesungen in dem Winterhalbenjahre von 1765-1766, in: Werke, ed.cit., Bd. 2, pp.305-313.

290. Kant, Immanuel: Neuer Lehrbegriff der Bewegung und Ruhe und der damit verknüpften Folgerungen in den ersten Gründen der Naturwissenschaft (1758), in: Werke, ed.cit., Bd. 2, pp.13-25.

291. Kant, Immanuel: Physische Geographie (ed. from Kant's manuscripts by his pupil Rink) (1802), in: Werke, ed.cit., Bd. 9, pp.151-436.

292. Kant, Immanuel: Recensionen von J.G. Herders „Ideen", 1. und 2. Teil (1784 and 1785), in: Werke, ed.cit., Bd. 8, pp.43-58.

293. Kant, Immanuel: Recension von Moscatis Schrift: Von dem körperlichen wesentlichen Unterschiede zwischen der Structur der Thiere und Menschen (1771), in: Werke, ed.cit., Bd. 2, pp.423-425.

294. Kant, Immanuel: Träume eines Geistersehers, erläutert durch Träume der Metaphysik (1766), in: Werke, ed.cit., Bd. 2, pp.315-373.

295. Kant, Immanuel: Über den Gebrauch teleologischer Prinzipien in der Philosophie (1788), in: Werke, ed.cit., Bd. 8, pp.157-184.

296. Kant, Immanuel: Versuch, den Begriff der negativen Größe in die Weltweisheit einzuführen (1763), in: Werke, ed. cit., Bd. 2, pp.165-204.

297. Kant, Immanuel: Von den verschiedenen Racen der Menschen (1775), in: Werke, ed. cit., Bd. 2, pp.429-443.

298. Kästner, A.G.: Das Lob der Sternkunst; Hamburgisches Magazin, Bd. 1, Hamburg, 1747, pp.206-222 (other articles in this periodical used by Herder, esp. in Bd. 1 and Bd. 4, were also consulted).

299. Kästner, A.G.: Geschichte der Mathematik, Bd. 4, Göttingen, 1800 (esp. pp.216-387, used by Herder for information on Kepler).

300. Kepler, J.: M. Caspar, Kepler (biography, ed. and transl. by C.D. Hellmann), London, 1959.

Knebel, K.L. v.: see No. 58 above.

301. Lambert, J.H.: Anlage zur Architektonik, Riga, 1771 (2 vols.).

302. Lambert, J.H.: Cosmologische Briefe über die Einrichtung des Weltbaues, Augsburg, 1761.

303. Lambert, J.H.: Neues Organon, Leipzig, 1764 (2 vols.) (See esp. Bd. 2, Teil 2, Phänomenologie, V. Hauptstück, Von dem Wahrscheinlichen, pp.318-421.

304. Leibniz, G.: Monadologie, in: Philosophische Schriften (ed. Gerhardt), Bd. 6, pp.607-623.

Leibniz, G.: see also No. 139 above.

305. Linnæus, C.: Philosophia Botanica (transl. into English by H. Rose), London, 1775.

306. Linnæus, C.: Versuch von Pflanzung der Gewächse; Abhandlungen der königlichen schwedischen Akademie der Wissenschaften, ed.cit. (c.f. No. 244 above), Bd. 1 (and other articles throughout this series).

307. Lucretius Carus, T.: Of the Nature of Things (transl. with notes into English verse by T. Creech), London, 1714 (2 vols.) (This is the edition from which Herder made excerpts in Riga).

308. Maupertuis, P.L.M. de: Essai de Cosmologie, in: Oeuvres, Tome 1, Lyons, 1768, pp.3-78.

309. Monro, A.: Structure and Physiology of Fishes, explained and compared with those of Man and other Animals, Edinburgh, 1785.

310. Needham, J. Turberville: An Account of Some New Microscopical Discoveries, London, 1745.

311. Needham, J. Turberville: Nouvelles Observations Microscopiques, Paris, 1750.

Newton, Sir Isaac: see No. 211 above.

312. Pallas, P.: Observations sur la formation des montagnes et les changemens arrivés au globe; Acta Academiae Scientiarum Imperialis Petropolitanae, 1771, Pars 1, St. Petersburg, 1778, pp.21-64.

313. Pistoi, Candido: Abhandlung über den Mechanismus wie sich die Luft und das elementarische Feuer in den Mischungen festsetzen und zu eignen Bestandtheilen der Körper werden (transl. from the Italian by C.F. Keller), Gotha, 1784.

314. Reimarus, H.S.: Allgemeine Betrachtungen über die Triebe der Thiere, 4. Ausgabe (ed. by Reimarus' son, J.A.H. Reimarus), Hamburg, 1798 (first published, 1760).

315. Schelling, F.: Ideen zu einer Philosophie der Natur, Leipzig, 1797 (esp. Book I).

316. Schelling, F.: Von der Weltseele, Hamburg, 1798 (esp. Theil I, Über die erste Kraft der Natur).

317. Shaftesbury, Anthony Ashley Cooper, 3rd Earl of: Characteristicks of Men, Manners, Opinions, Times, London[?], 1711 (3 vols.), Vol. 2 (The Moralists).

318. Smith, R.: A Compleat System of Opticks, Cambridge, 1738. (See esp. pp.42-70, Concerning our Ideas acquired by Sight, on Cheselden's operation, etc.)

319. Tyson, E.: Orang-Outang, sive Homo Sylvestris or, The Anatomy of a Pygmie Compared with that of a Monkey, an Ape, and a Man, London, 1699 (also contains "Philological Essay concerning the Pygmies etc. of the Ancients").

320. Wolff, Caspar Friedrich: Theoria Generationis (transl. into German by P. Samassa), in: Ostwalds Klassiker der exakten Wissenschaften, Nr. 84-85 (Bd. I & II), Leipzig, 1896.

321. Zimmermann, E.: Geographische Geschichte des Menschen und der vierfüßigen Thiere, Leipzig, 1778-1783 (3 vols.).

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